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### The E. C. Stirling Lectures.<sup>1</sup>

#### LECTURE I.

#### SOME RECENT ADVANCES IN THERAPY.

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#### Introduction.

I AM deeply conscious of the honour conferred by your invitation to deliver the E. C. Stirling Lectures. The privilege of commemorating the life-work of one of the really great men of the medical profession in Australia is an obligation which I feel all too unworthy adequately to fulfil.

<sup>1</sup> Delivered at Adelaide in May, 1938.

It will be recalled that Edward Charles Stirling, after a brilliant scholastic career in Adelaide, proceeded abroad to complete his medical education, and having achieved the highest professional qualifications in England, returned to adorn the profession of medicine in Australia, both as a pioneer in the field of surgical adventure and as a gifted and inspiring teacher in the Faculty of Medicine in this university. He was, as you are aware, in common with many of the illustrious members of our profession, distinguished by his work as a naturalist no less than by his brilliant success as professor of physiology, and worthily received the highest honours in the world of science, leaving a record of conscientious service and high endeavour which should ever remain an inspiration to the *alumni* of this university and a treasured memory to those who were privileged to know him as a teacher and to respect him as a man of high character and ideals.

In a country such as this, relatively isolated as it is from much of the cultural affinities of the older world, it is especially fitting and right that we should pay tribute to such men, outstanding in learning and culture, whose life and work have built up traditions of which we are justly proud.

In approaching the principles of the treatment of disease, and in reviewing some of the recent advances that have been made, it is therefore our duty to remember that the man whose life-work we commemorate was guided by an appreciation of sound physiological principles and by his powers of observation of the processes of nature as applied to the study of the phenomena of disease. To the physiologist the methods of observation and experiment form the basis of scientific progress. Empiricism and pragmatism have little part.

For us as physicians it is therefore well to analyse critically the foundations upon which the principles of treatment are based, so that we may with sound judgement determine our interferences with the morbid physiology of disease.

Principles of treatment are conveniently to be considered under three headings: aetiological indications (measures directed to recognition and control of aetiological factors, predisposing conditions, infective agents); pathological indications (measures based upon knowledge of pathological changes produced in affected organs and tissues, and of interference with the functional activity of organs); clinical or symptomatic indications (measures for the relief of symptoms causing distress to the patient and interference with bodily functions).

*Primum non nocere; secundo prodesse.*

In applying these principles to an acute infective disease, such as lobar pneumonia, it will be apparent that aetiological indications are concerned with means to prevent infection and specific measures to attack or to neutralize the effects of the infective agent; pathological indications are directed to assist the process of repair of the affected tissues and to aid the functional activities of the respiratory organs by means to provide adequate oxygenation in the diseased lungs; clinical indications deal with the relief of symptoms, respiratory embarrassment, cough, pain, sleeplessness, meteorism, and the various concomitant symptoms.

The late Harrington Sainsbury, in his philosophical work "*Principia Therapeutica*", stresses the essential therapeutic axioms: *primum non nocere* (it is first necessary that interference does no harm), *secundo prodesse* (secondly to endeavour to interfere helpfully in the morbid process of disease): a cogent reminder that meddling and ill-considered therapy is undesirable. If it should appear that these precepts have been unduly stressed, it is for the purpose of emphasizing the fact that the basic physiological principles of therapy remain unchanged though modern methods be evolved for their application and additional agents employed.

The period of the last ten years has been extraordinarily progressive in medicine and productive of enormous advances in therapy.

#### Serum Treatment of Lobar Pneumonia.

Pneumonia, so long regarded as "captain of the men of death", is rapidly becoming a controlled disease. This desirable state of affairs is, however, at present far from realization in Australia, and it is therefore our duty to review critically the advances in treatment which have been made in the United States of America and elsewhere, and to attempt to apply them as well as the means at our disposal permit.

On a recent visit to some of the medical centres in America I found that the serum treatment of pneumonia had been firmly established upon a sound basis and that the mortality from lobar pneumonia of Type I pneumococcus infection had been reduced from the anticipated 25% to 11.1% when patients received early and adequate serum therapy. In cases of infection by Type II pneumococcus the mortality rate had fallen from 41% to 27.2% in a large series of patients (Lord and Heffron<sup>(1)</sup>). Modern methods of rapid typing of pneumococci by the Neufeld technique have rendered this procedure relatively rapid and simple. In several of the larger centres in America central laboratories have been established to which specimens of pneumonic sputa may be sent by the practitioner and a report of the type of the infecting organism furnished in a period of an hour or so. Such pathological facilities should ultimately come to be established in the larger hospitals not only in the greater cities of the Commonwealth but in base hospitals in all country centres.

In America efficient concentrated sera are available commercially for infections by pneumococcus of Types I, II, V, VII, VIII, and are rapidly being evolved for several other strains.

Reference to the table of the incidence of infections by pneumococci of the several recognized types in a large series reveals that infections due to the four commonest types accounted for 67% of primary infections which are therefore amenable to serum therapy (Table I).

The exact incidence of the various types of infection does not appear to have as yet been adequately worked out in this country. There is reason to hope that this investigation will be undertaken shortly on a large scale.<sup>1</sup> Should the type incidence prove at all comparable with that of other countries the necessity for the adequate provision of concentrated serum at reasonable cost will become clamant.

The statement is frequently made that the case incidence and case fatality of pneumonia are possibly less in Australia than elsewhere. Analysis of the vital statistics for the State of New South Wales shows, however, that the deaths attributed to primary lobar pneumonia for the five-year period 1932-1936 reached a total of 3,452, an average of

<sup>1</sup>In May of this year the National Health and Medical Research Council allotted a grant for the establishment of a pneumococcal typing investigation at the Kanematsu Memorial Institute of Pathology at the Sydney Hospital. This service is now in operation.



TABLE I.  
Incidence of Various Types of Pneumococci. (After Kohl and Reitzel.<sup>(1)</sup>)

Types.	Total Cases.	Pneumonia.	Not Pneumonia.
I..	141	138 (48.8%)	3
II..	39	39 (12.1%)	0
III..	35	27 (8.5%)	8
IV..	3	3	0
IIA..	6	6	0
V..	8	5	3
VI..	4	2	2
VII..	15	14 (4.3%)	1
VIII..	9	5 (2.4%)	4
IX..	3	2	1
X..	2	2	0
XI..	1	1	0
XII..	1	1	0
XIII..	5	4	1
XIV..	2	1	1
XV..	2	2	0
XVI..	2	1	1
XVII..	2	1	1
XVIII..	1	1	0
XIX..	3	0	3
XX..	1	1	0
XXI..	2	2	0
XXII..	1	1	0
XXIII..	1	0	1
XXIV..	1	0	1
XXV..	1	0	1
Unclassified*	65	62	3
Totals ..	353	322	31

\* Only two of these failed to type when all diagnostic serums were used. Sixty-three were isolated previous to 1934.

\* This table is reproduced from *The Journal of the American Medical Association*, Volume CVI, 1936, page 1558.

690 per annum. There can be no reasonable doubt that the application of modern methods of serum therapy which have proved their efficacy abroad would be calculated to cause a pronounced reduction in these figures.

Concurrently with the improved results from serum therapy the administration of oxygen early and continuously by dosimetric methods has proved of great therapeutic value in cases of pneumonia. Apart from obvious cyanosis, a pulse rate in excess of 120 per minute, nervous symptoms, restlessness and insomnia are commonly regarded as indications for its regular employment. Excluding the judicious use of sedatives, the indications for the exhibition of drugs are few; rest, adequate nutriment and ventilation being regarded as the more important considerations.

Unless in the other States of Australia the position regarding pneumonia is very different from that in New South Wales the conclusion is unavoidable that as a profession we lag sadly behind other countries in our ordered attack upon the pneumonic diseases. If the evidence I have adduced has evolved in your minds "a divine discontent" in this matter and has inculcated an urge to strive for better results by the general adoption of modern methods of proven worth, this brief survey of the problem may not have been devoid of useful purpose.

#### Diabetes Mellitus.

The advances which have taken place in recent years in the study and control of *diabetes mellitus* form a striking chapter in medical progress.

It may be permissible to remind the younger graduates that up to the year 1922 diabetes was an imperfectly controlled and usually a rapidly fatal disease. The advent of insulin following the

brilliant work of Banting and Best entirely altered the outlook for the diabetic and modified the character of the disease and its clinical manifestations, greatly increasing the expectation of life for patients. The recent introduction of protamine zinc insulin has carried control to a further stage of efficiency. In the epigrammatic words of Joslin, "We have rung down the curtain on the Banting era and the Hagedorn age has begun".

During a recent visit abroad I was privileged to see the work of Wilder at the Mayo Foundation, and others, and reached the inevitable conclusion that the new insulin marked a decided advance, since blood sugar is controlled more efficiently and the number of injections is greatly reduced. This surely represents an enormous therapeutic advance and adds greatly to the comfort and welfare of patients.

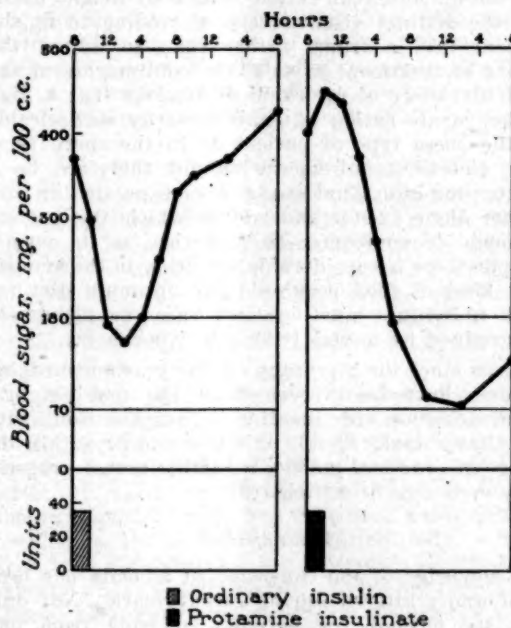


FIGURE I.

Graph of the effects of insulin and protamine zinc insulin. (After Wilder.<sup>(2)</sup>)

It is rapidly becoming manifest that the road of the diabetic is no longer necessarily a *via dolorosa*. Modern methods allow a reasonable dietetic régime so long as carbohydrate is moderately controlled and hyperglycæmia corrected with an appropriate daily injection of insulin. In almost all except severe cases a single daily hypodermic injection proves sufficient to maintain health and strength, the prolonged action of protamine insulin exerting long-continued control over carbohydrate metabolism.

It is, however, important to realize that the very advantages of slow insulin action involve certain difficulties, in that the onset of hypoglycæmia is apt to be much slower and less obvious than was

the case when the older (regular) insulin was employed. Not only does the body tolerate a much lower level of blood sugar, provided that the reduction has been gradual, but should symptoms of hypoglycæmia become established, its control is more difficult, frequently requiring repeated intravenous injections of glucose until a normal level of blood sugar is reached and stabilized. The advantages of the new method, however, outweigh so vastly the merits of the old routine with ordinary insulin that there can be no reasonable doubt of its utility. Time would not permit, nor does it seem desirable, to elaborate the details of protamine treatment, which already is becoming the established practice.

Standardization of treatment of disease, however theoretically attractive, is not without serious disadvantages. Rigid fixation of dietetic plans for the diabetic, calculated on a body-weight basis, has the distinct disadvantage of tending to fit the patient into a frame rather than to adjust the means of treatment to suit the requirements of the individual. It is, for example, obvious that a high carbohydrate ration is not necessarily so desirable in the obese type of patient as in the spare type. The dietetic requirements should therefore be a matter for individual study in each particular case rather than fixed standards to which the patient is made to conform. In diabetics, as in normal people, there is considerable variation in the amount and kind of food required; the optimum diet for each individual must in most cases be ultimately determined by actual trial and experiment.

Even since the beginning of this year encouraging reports have been received of the possible oral administration of insulin in combination with hexylresorcinol. Should this prove to be within the range of practical politics a further era of progress may even now be anticipated.

#### The Anæmias.

Knowledge of the causation of anæmia has been profoundly altered during recent years. Not only has the outlook for patients suffering from pernicious anæmia been revolutionized by the introduction of liver therapy following the work of Minot and Murphy in 1926, but our knowledge of the nutritional or an hæmatopoietic anæmias generally has been greatly advanced by the work of Witts in establishing simple achlorhydric anæmia as a clinical entity. From the clinical viewpoint anæmia is generally to be regarded as a symptom of disease of which the causal factors have to be sought, rarely as a primary condition in which the structure of the blood-forming elements in the bone marrow is essentially at fault, as in anæmia of primary aplastic type.

The study of erythropoiesis and recognition of the maturation factors affecting the development of the erythron have placed therapy upon a logical basis and led to the practical control of these diseases.

Well recognized as these factors are, there is still need for critical appreciation of the criteria of efficient treatment. It is an unfortunate fact that the very simplicity of control of pernicious anæmia has in some instances obscured the necessity for adequate and continuous dosage to avoid relapse and the development of subacute combined sclerosis.

Following the application of the modern parenteral method of treatment by injectable extracts of liver, the blood state can usually be readily restored to normal.

Should the response to adequate therapy be delayed or incomplete, chronic sepsis, sub-thyroidism or other factors should be carefully sought, or the diagnosis critically reviewed. In all cases the adequate maintenance dose has to be determined with considerable care and accuracy by serial blood examination. The quantity required to maintain the blood count and hæmoglobin value at normal levels has been found by various observers to vary within extraordinarily wide limits, some patients requiring ten times as great a maintenance dose as do others. In the case of well-to-do patients it is possible that the so-called "depot treatment" by an injection of a potent liver preparation at intervals of two to four weeks or longer will be found the most satisfactory means for maintenance; other measures have frequently to be devised for poorer patients, particularly those living in remote country districts.

In the treatment of an elderly patient under my personal observation for several years an adequate maintenance dose is provided by ox liver taken two or three times a week.

A quarter of a pound of bullock's liver is minced finely, soaked in hot water for ten to fifteen minutes, and strained through a sieve. The resulting pulp is flavoured with "Marmite" and taken as a broth.

In the treatment of hypochromic microcytic anæmia it has been shown that a generous diet with adequate vitamin content is essential, and that after the blood count has been restored to normal a maintenance dose of iron over a long period is usually desirable.

Trite and obvious as these observations may appear, the necessity exists to stress the need for continuous after-treatment of patients in each of these groups. In consulting practice it is all too frequent to find patients who have responded well to liver therapy, but who have gradually relapsed into subnormal health or who have developed symptoms of degenerative disease of the nervous system through lack of adequate maintenance treatment.

The large number of liver extracts of varying degrees of potency with which the market has been flooded is probably a factor in confusing the issue. It is still, therefore, the duty of the practitioner to control carefully the results of treatment by regular blood examination until the level of efficient therapy has been determined for the individual.



#### Sulphanilamide.

The application of sulphanilamide as an agent for the control of certain infective processes in the human subject, although still partially on an empirical basis, represents the most spectacular recent advance in chemotherapy. So far-reaching indeed are the claims of its advocates that were they all verified it might almost seem that the long-sought *therapia magna sterilisans* had been reached.

As is usual when any new remedy of considerable potency is introduced, the field of usefulness becomes magnified by its zealous supporters. After a period the leaven of experience determines its limitations and proper sphere of application. As this substance is rapidly becoming widely employed, it is well that there should be a clear conception of its application and recognition of the evidences of toxic effects. In a recent concise review of the position of sulphanilamide by Brown and Bannick,<sup>(4)</sup> of the Mayo Clinic, the following principles have been enunciated and appear to represent the present position.

The initial dose advised is 4.5 to 5.4 grammes (75 to 90 grains) in twenty-four hours. This dose is best divided into six parts, given at intervals of four hours, because absorption occurs from the intestinal tract in about four hours. It is advised that this method of administration be continued until a satisfactory concentration in the blood stream has been reached or until clinical improvement ensues or signs of toxicity appear. The dose should then be reduced to 3.6 grammes (60 grains) in twenty-four hours, given in four divided doses and continued until clinical improvement warrants its decrease, for example, to 3.0 grammes (50 grains) a day, a dose which might be continued safely for three or four weeks if necessary. In the treatment of small patients, for example, persons of approximately 100 pounds in weight, or in mild subacute or chronic infections, a similar treatment is employed, 3.6 grammes (60 grains) a day being given in divided doses.

Clinical experience of toxic effects has caused these to be grouped as mild, moderate or severe.

Mild evidences of toxicity are general malaise (most frequent), headache, anorexia, mild vertigo, tinnitus and nausea.

Moderately severe symptoms include the foregoing, together with cyanosis, methæmoglobinæmia or sulphæmoglobinæmia; numbness or tingling of the face, hands and feet; skin manifestations (*erythema multiforme*, the rash somewhat resembling measles); abdominal pain; diarrhoea; acidosis, and a toxæmia somewhat resembling that caused by methyl alcohol.

Severe toxic symptoms consist of the foregoing, to which may be added: (i) a condition of severe toxicity, collapse, fever, rapid pulse; (ii) leucopenia or granulopenia; (iii) hæmolytic crises, (iv) jaundice, due to blood destruction.

Early mild toxic symptoms are usually not difficult to deal with, and tend to subside in most instances if a moderate dose is continued or the dose reduced. Discontinuance of the drug altogether is frequently necessary.

Treatment of severe toxic effects consists in: (i) withdrawal of the drug; (ii) forcing fluids, because the drug tends to be rapidly and completely eliminated in the urine; (iii) blood transfusions, particularly in cases of leucopenia or hæmolytic crises.

It is claimed that sulphanilamide and "Prontosil" exert a specific chemotherapeutic action in infections due to *Streptococcus hæmolyticus*, gonococcus, meningococcus and organisms present in urinary tract infections, with the exception of *Streptococcus fecalis*. Their value is less certain in pneumococcal infection.

A recent investigation by Osgood<sup>(5)</sup> tends to suggest that doses much smaller than those usually advocated may ultimately prove desirable, the action of sulphanilamide being to neutralize toxin and to prevent multiplication of organisms in a concentration of 1 in 100,000 *in vitro*.

#### Modern Hypnotics and Analgesics.

An extraordinary number of hypnotics and analgesics have been produced in recent years. Many are examples of definite therapeutic advance. The lavish distribution of proprietary drugs as samples and their availability to the public over the counter of the pharmacist or department store constitute in many instances a distinct menace both to doctor and patient.

Apart from the barbiturates and their derivatives, of whose dangers much has been written, recent recognition of the occurrence of granulopenia following the exhibition of drugs with a pyrazolon basis, of which amidopyrine is the best known, should make it imperative that such substances be obtainable by medical prescription only. Moreover, it is essential that the prescriber should know exactly what is contained in the proprietary drugs offered so seductively by various drug houses.

Without an endeavour to compile a comprehensive list of commonly used substances containing amidopyrine, and therefore potentially productive of granulopenia, mention of the following fifteen proprietary preparations, many of which are readily purchasable by the public, should serve to stress the necessity for careful scrutiny: "Veramon", "Novalgin", "Amytal Compound", "Compral", "Asciatine", "Etipyrone", "Cibalgin", "Trigemin", "Dysmenol", "Amidophen", "Hebaral Sodium with Amidopyrine".

#### The Endocrines.

It is impossible in a short space to attempt an adequate review of endocrine therapy in modern medicine. Apart from the well-known employment of thyroid extract by oral administration, extracts of the adrenal, pituitary and parathyroid glands

and of the sex hormones by hypodermic injection, much uncertainty exists in exact knowledge of the sphere of usefulness of the ever-increasing number of glandular preparations supplied in tablet form. It is well to remember that a scientific basis for the efficacy of their administration by the oral route is in several instances incomplete, and that the indications for their employment by injection are in many cases still beset with difficulty and confusion, though the promise of enormous therapeutic advance lies along this path in the near future.

#### Vitamin Therapy.

The position of the vitamins as therapeutic agents has been vastly altered by the recent rapid advances in organic chemistry. No longer mysterious substances existing in variable quantity in certain foodstuffs, they have been recognized as chemical entities, some of which can be synthesized.

Deficiency diseases due to vitamin lack are rapidly decreasing and the vitamin substances in measured quantity are rapidly coming to be employed in the treatment of disease.

The antineuritic factor of vitamin B complex has been used successfully in the treatment of polyneuritis secondary to alimentary disorders, sprue, dysentery, chronic alcoholism *et cetera*, and has been advocated for the treatment of degenerative diseases of the nervous system.

The synthesis of vitamin C (ascorbic acid) on a commercial scale is one of the most striking examples of recent chemical research. The daily human requirement of vitamin C has been shown to be about 25 milligrammes of ascorbic acid. Apart from its recognized antiscorbutic properties it has recently been shown to have a field of usefulness as a diuretic in certain cases of cardiac oedema. Powers of increasing glycogen storage in the liver in diabetes and in expediting the process of healing of gastric ulcer have recently been attributed to ascorbic acid.

#### Discussion.

This necessarily brief review of some of the advances in therapy which recent work has made possible cannot but inspire an enduring faith in the progress of medicine. An attitude of therapeutic nihilism is entirely untenable. Much that has been recently achieved is admirable, but a benign complacency is not to be desired in our attitude to the medical services enjoyed by our community. Reference has been made to the effects of our relative isolation from the centres of learning in the Old World and in America, and any insularity in our outlook is to be deplored.

It is our duty to be ever ready to adopt new and proven methods in the treatment of disease, and to be tireless in the search for truth.

If our geographical position renders it difficult to keep in close personal touch with the leaders of thought elsewhere, it should act as an incentive

to individual effort and sharpen the critical faculty. On the other hand, the absence of a wealthy valetudinarian class in this country renders less likely the development of cults and bizarre therapeutic systems, clinics devoted to colonic lavage for all human ills and recondite systems of dietetic fantasy.

Nevertheless we are as a profession strangely the creatures of fad and fashion in therapy, and still tend to be hag-ridden by the time-honoured tradition that the public demand a bottle of medicine for all the ills to which flesh is heir, a fact fully exploited by the vendors of patent medicine, whose commercial enterprise not infrequently outruns the judgement of their scientific advisers.

It is for the profession a solemn duty and obligation to review critically the claims of new therapeutic agents and to endeavour to apply physiological principles rather than to succumb to the mass suggestion of the showers of pamphlets and samples of drugs which descend daily upon the desk of the physician almost like manna from heaven.

Unfortunately the sophistries of the drug vendor and the subtle insinuation of clever advertisement too often prevail upon many of our professional brethren, benumbing the critical faculty and increasing the sales of proprietary preparations whose very number is often striking testimony to their therapeutic worthlessness.

With less ready access to the older centres of learning, the public and the profession in Australia are possibly more liable to be misled in these matters than are our professional colleagues in other countries, in which organizations exist for the investigation of the value of therapeutic substances, such as the Medical Research Council in Great Britain or the Council of Pharmacy and Chemistry of the American Medical Association, which publicly describes as "unacceptable" medicaments which fail to comply with its standards.

It may be opportune to voice the pious hope that such a public service may eventually become a function of the recently constituted National Health and Medical Research Council of Australia.

In our attitude to the newer therapy in general it is necessary to have constant regard to the basic physiological principles of treatment, remembering the watchword of Ulysses on his voyages: "To strive, to seek, to find, and not to yield."

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- <sup>3</sup> R. M. Wilder: "Clinical Investigations of Insulins with Prolonged Activity". *Annals of Internal Medicine*, Volume II, Number 1, July, 1927, page 13.
- <sup>4</sup> A. E. Brown and E. G. Bannick: "Use of Sulphanilamide and Prontosil Solution". *Proceedings of the Staff Meetings of the Mayo Clinic*, Volume XII, Number 41, October 13, 1927, page 644.
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SIMPLE PROCEDURES IN THE TREATMENT OF PAINFUL FEET.<sup>1</sup>

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Melbourne.

OBSERVATIONS made in this paper are based upon personal experience of a very large number of cases seen at the Shropshire Orthopaedic Hospital, Oswestry, during the past four years. No attempt is made to tabulate completely the aetiology or pathology, and few details of operative procedures are given. The theme of the paper is intended to be the management of painful feet. There are, of course, many notable omissions, since the subject is too vast to deal with completely. Various conditions are referred to only because they are very common or very interesting.

## FLAT-FOOT.

Probably the commonest cause of pain in the foot is some form of flat-foot. The position of the foot, which should be understood if the rationale of various procedures adopted in treatment is to be appreciated, in a typical case, is as follows: (i) the heel is everted and the *tendo Achillis* appears deviated to the outer side of the *os calcis*; (ii) the fore part of the foot is supinated relative to the heel; (iii) the fore part of the foot is abducted at the mid-tarsal joint, the inner border of the foot being made convex; (iv) the long arch is flattened; (v) the metatarsal heads are raised relative to the rest of the foot; (vi) there are frequently associated toe deformities.

Note, as Böhrer pointed out, that the position is the mirror image of claw-foot. It is probable also that the cycle of events which ends with the foot in the above position begins with eversion of the heel. The rest automatically follows.

## Clinical Types of Flat-Foot.

Clinical types are purely arbitrary and merge into one another. The classification, however, serves a useful purpose inasmuch as it helps to clarify the issue as regards the proper method of treatment to adopt.

## Incipient Flat-Foot.

Incipient flat-foot is the earliest form of flat-foot. There is as yet little or no deformity, except perhaps a slightly valgoid condition of the heel, which may be recognizable only when viewed from behind. In small children this may be accompanied by pronounced "in-toeing", which, except for slight clumsiness in walking, is symptomless. In adolescents and adults the pain may be severe. The condition of "acute foot-strain" usually comes into this category.

## Voluntary Flat-Foot.

In voluntary flat-foot some collapse of the long arch is apparent. The foot is still mobile and the arch can be voluntarily reconstituted by active movements, that is, by the patient's own efforts.

## Resistant Flat-Foot.

In resistant flat-foot the deformity has advanced. Soft part contractures, adapted to the abnormal position of the foot, a few adhesions and possibly very early arthritic changes prevent reconstitution of the arch by active movements. It is, however, still possible for the examining surgeon to remould the foot into approximately its normal shape (passive movements).

## Rigid Flat-Foot.

By the time the condition of rigid flat-foot has developed, osteoarthritic changes have occurred in the tarsal joints, adhesions are denser and soft part contractures are fixed. Callosities are beginning to form under pressure points, owing to the loss of elasticity in the foot. The foot is quite stiff to the examining surgeon.

## Osseous Flat-Foot.

Osseous flat-foot is the ultimate stage of flat-foot, the foot being now permanently fixed in the deformed position, by rigid soft part contractures, adhesions and ankylosed joints.

## The Pain of Flat-Foot.

"Burning" is the most popular of the many descriptive terms used to describe the pain of flat-foot. Actually I think the feet just ache; and when callosities are present they hurt just as any other corn. Features of the pain worthy of note are as follows: (i) It is worse when standing; (ii) it tends to be localized under the highest point of the long arch, namely, at or near the scaphoid tubercle; (iii) it may be referred over the dorsum of the foot and on either side of the ankle; (iv) it may be referred up the calf (cramp); (v) in more advanced types the patients often refer to "walking on their bones" when referring to pain under the tread, the common site of pain in these types. It must be remembered that well-marked flat-foot may be present throughout life and remain entirely symptomless.

## The Management of Flat-Foot.

The three fundamental principles in the management of flat-feet are: (i) control of deformity, (ii) relief of pain, (iii) attention to footwear.

*Control of the Deformity.*—It is very much worth while in the earlier forms of flat-foot not only to relieve the immediate symptoms, but also to prevent the progress of the deformity to more advanced stages. The primary deforming factor in flat-foot is probably relative weakness of the muscles on the inner side of the heel and foot. Eversion of the heel thus readily occurs when these muscles become fatigued. As previously mentioned, this starts the cycle of events which is seen in its earliest form in the "in-toeing" foot of a small child, and in its most advanced stage as rigid flat-foot.

The simple procedure of raising the heel of the shoe on the inner side (known as "crooking") readjusts the weight-bearing surface of the astragalus so that it falls directly beneath the tibia

<sup>1</sup> Read at a meeting of the Victorian Branch of the British Medical Association on May 4, 1938.

and also relieves the strain on the weakened invertors of the foot. Further support to the arch is achieved by elongation of the heel to the level of the mid-tarsal joint. In mobile flat-feet these measures usually give, in addition, rapid relief from symptoms.

The effect of these procedures is most easily followed when applied to the "in-toeing" of young children. The mother has noticed that the child turns in its foot while walking. Excepting a small percentage of congenital *metatarsus primus varus*, careful examination of these feet, especially from behind, will reveal a valgoid heel. The condition is in fact an early stage of flat-foot, and the adduction of the fore part of the foot is an unconscious effort at compensation for the valgoid heel and falling arch. Without treatment the foot eventually flattens; the adduction of the fore part of the foot is replaced by abduction. Crooking (raising) and elongating the heel reestablishes the proper weight-bearing axis through the astragalus by correcting the eversion, and supports the weakened structures on the inner side of the heel and foot. The deformity of the fore part of the foot rapidly resolves, and eventually the foot will appear normal.

In practice it is not always quite so simple as that. The cooperation of the patient (if old enough) or of the mother must be obtained if ultimate success is to be achieved. All the patient's shoes must be similarly altered; no slippers or sandshoes are permitted, and in no circumstances whatever may weight-bearing be allowed, even for one second, unless the proper footwear is worn. Unless cooperation in these respects is obtained as well as in other home treatment, such as the regular performance of the exercises that may have been ordered, either treatment will be prolonged intolerably or there will be bitter disappointment in the end-result. One further point: treatment should always be continued for many months after the deformity appears completely controlled, because of the tendency to relapse.

The above measures are applied to all forms of mobile flat-feet and to more advanced types if, by manipulation or physiotherapeutic measures, they can be rendered mobile. It is obviously useless, in fact worse than useless, to treat rigid and osseous flat-feet by similar measures. In these cases attempts to alter the line of the weight-bearing surfaces only increase the patient's discomfort; so that the procedures adopted are designed purely for the relief of pain.

**Relief of Pain.**—The measures adopted to control the deformity also relieve the symptoms in most forms of mobile flat-feet. Occasionally, in rare cases of acute foot-strain in which relief from pain is delayed, physiotherapeutic measures, in the nature of hot and cold contrast baths and gentle massage to the foot and ankle, are useful. These measures are particularly indicated where, as a result of badly fitting shoes, especially in heavy subjects with small feet, there is considerable swelling and even

œdema over the dorsum of the foot and about the ankle.

In the more advanced types (rigid and osseous flat-feet) treatment is more local and is directed at the immediate relief of pain, especially as the patients are generally elderly. Particular attention is directed to the shoes, the first consideration being that they are big enough. The shape is of little moment.

Callosities should at first be protected by suitable pads and felt rings. If these simple measures are either not feasible or unsuccessful, then local excision of the callosities should be performed. The most troublesome callosities are usually under the tread, and are due to the relative proximity of the metatarsal heads to the ground and to weight-bearing on surfaces unused and unsuited to it. Adequate protection can be obtained by the judicious use of the soft spongy metatarsal button. The exact positioning of the button, which should be immediately behind the second, third and fourth metatarsal heads, requires the most careful cooperation between the patient and the surgeon, and many minor adjustments in position may be required before relief from pain is obtained.

**The Shoe.**—The selection of shoes is probably the most important factor of all, and it is necessary that the advice given should be suited to the case in point. It is quite unnecessary to adhere slavishly to a standard orthopædic shoe, however well it may conform to basic principles, nor is it of any moment whether shoes or boots are worn. Generally speaking a shoe should embody the following principles:

1. It should be big enough. (a) There must be room for the toes without bunching; the toe-cap is usually squared. (b) The shoe must be long enough from heel to toe. (c) It must be deep enough, especially if ring pads, buttons *et cetera* are to be worn inside.
2. The inner border should be straight.
3. The heel should be squared. There should be a broad flat surface to place firmly on the ground. It need not necessarily be low; in fact, within limits, the patient may adjust the height. It is quite useless to expect people who have been used to wearing high heels to change suddenly to low ones. They, in such circumstances, frequently suffer from severe calf strain, which aggravates their discomfort.
4. The heel should be a flat or concave table inside the shoe, in order to avoid the inclined plane effect of the modern fashionable shoe.
5. The sole must not be allowed to become concave under the tread.
6. The shoe should fit snugly around the instep.

Naturally the chief difficulty is encountered with young ladies of fashion, to whom the mere suggestion of this type of shoe is revolting. There is no reason why the outer side of the toe should not be shaped a little; and it is amazing how a skillful bootmaker can make an attractive shoe which still conforms to these principles.

#### Metatarsalgia.

Metatarsalgia is a clinical syndrome in which splaying of the fore part of the foot and flattening of the so-called anterior metatarsal arch is accompanied by severe pain in the fore part of the foot.



It may or may not be associated with dropping of the long arch of the foot. The most obvious clinical feature is often an almost bulbous convexity under the tread, due to great prominence of the second, third and fourth metatarsal heads, which normally take little part in weight-bearing. The pain is severe and is caused by undue strain thrown on the structures supporting the transverse arch, particularly the transverse metatarsal ligament.

Often manual compression from side to side gives immediate relief from pain during the ordinary course of examination. The fore part of the foot is strapped to support the anterior arch, and this is sufficient for the immediate relief of symptoms. A metatarsal button is necessary to support and protect the tread and prevent a recurrence of pain when the strapping is removed. It should be worn for many months afterwards, and in some instances permanently.

#### Spasmodic Flat-Foot.

The term "spasmodic flat-foot" is used to describe a clinical syndrome consisting of flat-foot of rapid onset in adolescents, due to spasm of the evertors of the foot. It is frequently bilateral in such cases; one side generally precedes the other and is usually at a more advanced stage. The condition is alleged to be associated with a septic focus, teeth and tonsils particularly being regarded with suspicion. I have never seen the removal of the most obvious septic focus alter in any way the course of the condition once it has become established. If treatment is not instituted the condition will progress to a really rigid type of flat-foot with a severe degree of deformity. The exciting cause of the deformity is almost certainly a mid-tarsal or subastragaloid arthritis resulting in reflex spasm in the evertors of the foot, especially the peronei.

The feet are as a rule painful, and usually there are cramping pains up the calf. The onset may be fairly sudden over a matter of one or two weeks. Personal observations suggest that the long slender type of foot is most commonly affected.

Any attempt to invert the heel aggravates the pain and throws the peroneal muscles, both long and short, into visible spasm. It is extremely important to note that in many cases the *peroneus tertius* and, in rare instances, the long extensors to the outer toes, are also implicated.

In most patients under anaesthesia spasm in the affected muscles disappears and the deformity is easily corrected. Nevertheless I believe that tenotomy of the tendons of the affected muscles is essential, since there is probably already some static shortening which is not apparent under anaesthesia; also the immediately exciting cause is still present and may persist for some considerable time.

After tenotomy the foot is manipulated sharply and put up in full inversion (over-corrected) in a walking plaster cast for fully two months. Through a window cut in the plaster electrical stimulation to the invertors of the foot is worth while. For

several weeks after the removal of the plaster an outside iron and inside "T" strap are worn, and the usual heel alterations as for flat-foot are made and persisted with for many months.

#### Recapitulation of the Treatment of Flat-Foot.

Let me briefly recapitulate the essential points in the treatment of the various types of flat-foot.

1. Incipient flat-foot: The wearing of crooked and elongated heels and the use of flat-foot exercises.
2. Voluntary flat-foot: The provision of crooked and elongated heels and flat-foot exercises.
3. Resistant flat-foot: Manipulation under anaesthesia, remoulding of arch. Plaster fixation for three weeks if the feet are very painful. It is an attempt to convert it to a completely mobile "voluntary" flat-foot. Subsequently crooked and elongated heels, flat-foot exercises, physical therapy if necessary, and occasionally an iron and "T" strap should be used.
4. Rigid flat-foot: Forceful manipulation, fomentation, then physical therapy. If it becomes mobile (occasionally it does in young people), proceed as above. Local treatment should be used for pain; callosities should be protected or excised; the metatarsal button *et cetera* may be used. Occasionally stabilization of the foot may be necessary.
5. Osseous flat-foot: Local treatment only; stabilization in exceptional cases.
6. Metatarsalgia: Strapping and metatarsal button.
7. Spasmodic flat-foot: Eliminate septic foci. Carry out tenotomy of affected tendons. Use plaster fixation for two months, crooked and elongated heels, iron and "T" strap.

Occasionally in young adults a grossly valgoid rigid flat-foot is present. It is not only sometimes extremely painful, but causes the patient to walk in an awkward shuffling manner, which may render him unfit to follow any strenuous occupation. In these circumstances it is worth while doing more than simply relieving pain by local measures such as one would use on an elderly female patient.

The mid-tarsal and subastragaloid arthrodesis of Naughton Dunn is the best procedure, after which the foot is remoulded into its proper weight-bearing shape and fixed in plaster for from four to six months. The patient walks after three weeks in a walking cast, and generally a very sound and useful foot is obtained.

No mention has been made of the treatment of such conditions as knock-knee, bow-legs, Pott's fractures *et cetera*, which are frequently the cause of the flat-foot and must obviously be treated at the same time.

#### CLAW-FOOT.

As has already been indicated, the deformity of claw-foot is the mirror image of flat-foot. The heel is inverted; the *tendo Achillis* is deviated towards the inner side. The fore part of the foot is pronated relative to the heel. The fore part of the foot is adducted at the mid-tarsal joint, the inner border of the foot being made concave. The long arch is raised. The metatarsal heads, especially the first, are dropped relative to the rest of the foot. Associated toe deformities are present.

I believe that badly fitting shoes play an important part in the progression, if not the actual beginning, of the deformity. Among the poorer

classes the practice of passing the elder child's boots on to the rapidly growing younger brothers and sisters is a potent factor in the causation of claw-foot. At first the boots are too big, and in attempting to get a purchase on the ground the toes are clawed. When the child outgrows the boots, the toes, already tending to flex, become bunched up and forcibly flexed inside the boot. Lambrinuidi, of Guy's Hospital, believes that the clawing of the toes is the first of the cycle of events which eventually leads to the typical claw-foot deformity. The rationale of the operation which bears his name is based on this fact.

As with flat-foot, and for the same reason, it is convenient to divide the various stages of the deformity into arbitrary groups, each, of course, merging into the other.

#### Clinical Types of Claw-Foot.

The clinical types of claw-foot are as shown in Table I.

TABLE I.  
Clinical Types of Claw-Foot.

Stage.	Symptoms.	Signs.
I	May be painless. Patients are clumsy walkers and wear out boots quickly.	(i) Foot is still mobile and elastic. (ii) A mild degree of deformity is present. (iii) The deformity is corrected by light pressure under tread, excepting that the deformity of the toes is usually slightly increased when the foot is dorsiflexed.
II	Pain under tread. Aching pain and occasionally cramp in the foot. Pain from callosities.	(i) The deformity is now well marked. (ii) The foot is still elastic and fairly mobile. (iii) The deformity is not corrected by firm pressure under the tread. (iv) Contractures have occurred in the plantar fascia, long and short plantar ligaments, and the short muscles of the foot arising from the tuberosity of the <i>os calcis</i> . (v) Extensor tendons stand out prominently over the bases of the toes. (vi) Callosities may be present. (vii) The patient walks on the outer side of the foot.
III	Pain from callosities. Pain from arthritic joints, usually specially severe under the tread.	(i) The deformity is now gross. (ii) The foot is inelastic and rigid; arthritic changes have appeared in the tarsal joints. (iii) Painful callosities are present under the tread, along the outer side of the foot, particularly under the base of fifth metatarsal, and over the prominent or subluxated interphalangeal joints of the toes. (iv) Subluxation of metatarso-phalangeal and interphalangeal joints. The toes are rigid in clawed position. (v) The circulation is occasionally poor; trophic changes occasionally occur.

#### The Pain of Claw-Foot.

Patients with claw-feet are clumsy walkers and stamp their feet rather heavily. Children wear out their shoes so quickly that their repair *et cetera* constitutes a very real burden on an already heavily involved and carefully estimated family budget; and since the feet are frequently painless, it is on account of this and for no other reason that the mothers sometimes seek advice. Actually, if

untreated, the vast majority of such feet will progress to a more advanced and almost certainly painful stage of claw-foot.

The pain of claw-foot is chiefly localized under the tread, and even in the absence of callosities may be of an intense burning nature, aggravated by walking. As in any painful condition of the foot, the muscles supporting the arch are in reflex spasm. The foot rapidly becomes fatigued and aches. Occasionally cramp-like pains are referred over the foot and up the leg. When arthritic changes supervene in the joints pain from these adds to the patient's discomfort.

When callosities are present over pressure points the pain is, of course, localized in them and is of the intense burning character so familiar to sufferers from corns. The callosities under the tread are the most troublesome. The various home-made pressure pads *et cetera* that do give some measure of relief from the pain of callosities on the toes, invariably fail to relieve, and in fact generally increase the discomfort from those under the tread.

#### Treatment of Claw-Foot.

##### Treatment in Stage I.

A metatarsal bar, accurately placed just behind the tread, will stretch and ultimately correct the deformity in children and control it in adults. There are two varieties of bar: (i) leather, worn outside the sole; (ii) spongy rubber, worn on an insole. The bar should be worn for many months after the correction is complete.

##### Treatment in Stage II.

Operative measures are necessary in most cases in Stage II unless there is some definite contra-indication. Obviously in elderly patients simple palliative measures are resorted to; but, generally speaking, it is worth while adopting fairly drastic measures. Each case is, of course, treated on its merits, but with gradually increasing degrees of deformity they are dealt with as follows.

Division of the plantar fascia and use of the wrench, probably the commonest procedure on the operating lists of an orthopaedic hospital, consist of subcutaneous division of the plantar fascia, long and short plantar ligaments, and muscles attached to the tubercle of the *os calcis*. The foot is then forcibly manipulated with a Thomas wrench and the plantar structures are stretched so that the foot can be easily maintained in an over-corrected position by light pressure under the tread.

In addition, the following procedures may be necessary: (i) tenotomy of the flexor and extensor tendons to the toes if there is any residual deformity of the toes on dorsiflexing the foot; (ii) excision and arthrodesis of interphalangeal joints if there is any suggestion of callosities over the joints, subluxation of the joints or rigidity of the toes; (iii) transplantation of the insertion of the *extensor hallucis longus* to the head of the first metatarsal if the metatarsal head is very prominent under the tread after the rest of the deformity is corrected.



By these means the claw-foot has become temporarily converted into a flat-foot. It is immobilized in a walking plaster cast in the over-corrected position for at least three months. At the end of this period it should be possible for the patient to wear normal shoes; but all patients must be watched carefully for a considerable time, owing to the tendency to relapse. A metatarsal bar will always control this tendency to recurrence of deformity if applied in time.

Lambrinuidi as a routine procedure performs arthrodesis of all the interphalangeal joints and has devised a simple splint which ensures that the metatarso-phalangeal joints are maintained in a slightly flexed position for six weeks after the operation, the patient remaining recumbent during this period. The procedure has much to commend it; and so far all patients that I have seen treated by this method have progressed satisfactorily.

#### *Treatment in Stage III.*

The proper procedure in the third stage depends greatly upon the age of the patient, and is either operative or palliative.

**Operative Treatment.**—(i) In young active patients whose feet are too rigid to respond to even a Thomas wrench, bone resection is advisable. The subastragaloid and mid-tarsal arthrodesis of Naughton Dunn is the best procedure; after this the foot is remoulded into the proper weight-bearing position and immobilized in a plaster cast for at least three months (in the case of children for as long as six months). The patient walks, wearing the cast, after three weeks.

(ii) In the most severe types of deformity the toes may be so grossly clawed that the metatarso-phalangeal joints are subluxated and movement at these joints is practically nil. In these circumstances it is advisable to amputate the toes at the metatarso-phalangeal joints. A felt pad is worn in front of the foot to replace the gap in the shoe. The great toe should never be amputated in such circumstances. If the first metatarso-phalangeal joint is similarly subluxated, then some form of arthroplasty is indicated and is usually worth while.

**Palliative Treatment.**—In the case of older patients, or where there is some contraindication to drastic operative procedures, excision of callosities, arthrodesis of subluxated interphalangeal joints, or tenotomy of flexor and extensor tendons to the toes should be performed if possible. If these procedures are not feasible, sticky felt ring pads may be placed over callosities and a soft moulded metatarsal bar, usually curved, may be applied immediately behind the tread. Both of these protect the callosities from undue pressure. Considerable patience is required by the surgeon in the adjustment of these appliances; but it is extremely unusual if the patient is not made reasonably comfortable. It is obvious also that the shoe must be big enough, especially deep enough, to contain both

the foot and the added encumbrances, without undue pressure.

Obviously there can be no age limit for one or the other form of treatment, and it is not possible to lay down definite criteria by which an individual case is judged as suitable or not for bone resection or other operative procedure. So much depends on the activity of the patient, the mode of life, the general physical condition and mental outlook, that each individual case must be judged on its merits and one or more of the procedures just mentioned performed.

#### TOE DEFORMITIES.

Deformities of the toes are frequently associated with flat-foot and claw-foot.

#### Hallux Valgus.

Although in many instances congenital abnormalities, such as *metatarsus primus varus* and *metatarsus atavisticus*, predispose to the development of *hallux valgus*, the real cause in the majority of cases is the wearing of badly fitting and badly designed shoes. In this regard the high-heeled shoe with a small pointed toe, the sole of which forms an inclined plane so that the foot constantly tends to slide downwards and forwards into the toe, is the chief offender. The bunching effect on the toes is obvious; overriding is common. The hallux is forced into abduction. The second toe, being pushed out of the way, accommodates itself better in a more confined space by assuming the shape known as hammer-toe.

In the deformed position part of the joint surface on the inner side of the first metatarsal head becomes exposed, arthritic changes supervene in the joint, and osteophytic outgrowths increase the prominence on the inner side of the toe. Pressure of shoe leather over this region causes the typical bunion to form. Structures on the outer side of the toe and more particularly the long extensor of the toe, which acts as a bow-string, contract and maintain the deformity.

#### *The Pain in Hallux Valgus.*

Pain is principally due to the bunion, which may become inflamed and may suppurate. When arthritic changes in the joint occur the limitation of movement, which may amount to *hallux rigidus*, interferes with walking and pain is experienced each time weight is borne on the first metatarsal head.

#### *Treatment.*

A simple splint strapped along the inner side of the toe will control and sometimes correct the deformity in the early stages. Particular attention should be given to the shoes, and the iniquitous article referred to above, avoided at all times.

An operation is necessary in all other cases. The procedure known as Kellar's operation is the best in the great majority of cases. It is simple, is done quickly, and is in fact an arthroplasty of the first metatarso-phalangeal joint. In brief, it consist in (i) removal of the bunion, (ii) trimming

the osteophytes from the metatarsal head, and (iii) excision of at least half of the proximal phalanx.

The after-treatment varies in different hands from the application of a small extension splint, in which movement is begun on the same day, to immobilization in a plaster slipper for four weeks. I have been unable to satisfy myself that any particular method has any special virtue, except that with plaster fixation recumbency is necessary for only two days. This is a consideration of some importance to a busy housewife.

Shoes with a straight inner border should always be worn after operation (one usually finds that the patients now need very little persuasion) and it is sometimes advisable to crook the heel when weight-bearing is begun.

#### Hallux Rigidus et Flexus.

The condition of *hallux rigidus et flexus* is due to arthritic changes in the metatarso-phalangeal joint. It frequently follows trauma, often consisting of repeated minor injuries, especially if the great toes project rather more than usual beyond the remaining toes.

#### The Pain in Hallux Rigidus et Flexus.

Movements of the joint are limited, extension past the neutral position being lost. This joint is the fulcrum about which the foot moves when being levered off the ground in walking. Pain is therefore experienced in the joint at each step. In an endeavour to avoid pain the patient walks with the foot in a valgoid position and the foot is lifted rather than levered from the ground. As a result the muscles rapidly tire, so that in addition to the local pain in the hallux there is a general aching all over the foot and sometimes referred up the leg.

#### Treatment.

Operation is necessary in all cases, and the arthroplasty described above is the most suitable procedure.

#### Hammer-Toe.

Hammer-toe usually occurs in the second toe, occasionally in the third toe. It is frequently associated with and often caused by *hallux valgus*, and is practically always the result of badly fitting shoes. The position the toe assumes is hyperextension at the metatarso-phalangeal joint, flexion (eventually with subluxation) of the proximal interphalangeal joint, and hyperextension of the terminal interphalangeal joint.

#### The Pain of Hammer-Toe.

Pain is caused by callosities over the prominent proximal interphalangeal joint and under the ball of the toe.

#### Treatment.

Preventive treatment consists in attention to footwear and strapping the toe in the corrected position to the adjacent toe. In the case of children and in early cases this controls and may even correct the deformity.

Operation is necessary in all cases in which a callosity has formed. It consists in: (i) excision of an ellipse of skin, including the callosity over the interphalangeal joint; (ii) excision and arthrodesis in the extended position of the interphalangeal joint.

The most satisfactory method of after-treatment is to put on a plaster slipper, in which the patient can walk for three or four weeks. A collodion splint is then all that is necessary.

#### MISCELLANEOUS CONDITIONS.

Under miscellaneous conditions come all the really interesting conditions which cause pain in the foot.

#### Painful Heel.

##### Hyperostosis of the Os Calcis.

Hyperostosis of the *os calcis* is especially common in young females and is yet another condition caused by shoes that are too small. The condition is in reality chronic bursitis deep to the *tendo Achillis* over the prominent posterior aspect of the *os calcis*, and is due to pressure of shoe leather.

**The Pain.**—The pain is felt behind the heel and is aggravated by walking. The skin may be thickened and red over the tuberosity of the *os calcis*, which is more prominent than usual, owing to the presence of excessive granulation tissue. Local tenderness may be quite pronounced. X ray examination shows nothing abnormal.

**Treatment.**—(i) Remove the stiffening from behind the heel of the shoe and replace by a soft chamois-leather shield. Raise the heel half an inch. (ii) If pain persists after a trial of these measures an operation is necessary, in which the region is explored and excessive granulation tissue is removed from immediately deep to the *tendo Achillis*, just above its insertion, and adherent to the underlying bone.

##### Spur on the Os Calcis.

**Fibrositis of the Heel.**—An *os calcis* spur causes no pain *per se*, and many spurs are found in routine X ray examinations. Painful heel in which an *os calcis* spur has been discovered is due to fibrositis in the soft parts under the bone, and almost certainly the fibrositis is the immediate cause of the spur formation. The spur remains after the fibrositis has resolved. The fibrositis may be rheumatic, infective, gouty or gonococcal.

**The Pain.**—Pain may be severe enough to constitute a very real disability. It is of a burning nature and is felt every time the weight is borne on the heel.

**Treatment.**—General treatment should be directed towards the cause of the fibrositis. Septic foci are eliminated. As local treatment the heel of the shoe is hollowed out and replaced by a soft springy "Sorbo" rubber sponge. Excessive weight-bearing is avoided for one or two weeks. I have rarely seen a case in which operative removal of the spur was necessary or even advisable.



*Apophysitis of the Os Calcis.*

Apophysitis of the *os calcis* is an example of disordered epiphyseal growth similar to Köhler's, Perthes's and Schlatter's diseases; it occurs in adolescents and, followed radiologically, pursues the same sequence of events.

**The Pain.**—A very large number of such cases are quite symptomless and are discovered by accident in routine X ray examination of the feet. Occasionally there is aching pain at the back of the heel, not aggravated by weight-bearing, but increased by walking. Local tenderness may be present, but is not so characteristic as in the painful heel of hyperostosis, nor is there any swelling.

X ray examination shows the epiphysis usually in the stage of hypercalcification. Occasionally revascularization, with patchy hyperæmia, causing the appearance of fragmentation, is seen. I have never seen any gross deformity of the epiphysis.

**Treatment.**—Remove the stiffening from behind the heel and replace with a soft chamois-leather pad. Raise the heel of the boot half an inch. Most cases respond to these simple measures. If not, the foot should be immobilized in a plaster cast until the pain subsides. It is inadvisable to recommence walking in the cast for two or three weeks. The condition always resolves and causes no lasting disability.

*Köhler's Disease of the Scaphoid.*

Köhler's disease is another example of disordered epiphyseal growth in children. It manifests itself by pain and occasionally by swelling over the region of the scaphoid tubercle. While not severe, the pain is usually sufficient to cause a limp. This lesion, however, may be symptomless. The scaphoid is the keystone of the long arch of the foot. There is a very great tendency for the bone to become considerably flattened and deformed in this condition, so that it is necessary to protect the region from undue strain.

*Treatment.*

The foot is encased in a plaster cast, carefully moulded to maintain the long arch of the foot, for several weeks after all symptoms have disappeared. Weight-bearing is begun at first in the plaster cast, which it is usually necessary to retain for about six months in all. Crooked and elongated heels are worn for many months after the plaster is discarded.

It is interesting to note that the only instance of fracture in the foot that I have ever seen following forceful manipulation with a Thomas wrench was a crush fracture of both scaphoids of a patient who had had bilateral Köhler's disease ten years before.

*Accessory Scaphoids.*

Occasionally the scaphoid ossifies by two centres, and the inner one, which constitutes the tubercle, persists as a separate ossicle. It is frequently a cause of pain because it is movable over the main

body of the bone through a small partially formed joint, which is the seat of the pain. Removal of the ossicle gives complete relief from symptoms.

*Panner's, Freiberg's or Köhler's Disease of the Second and Third Metatarsal Bones.*

Panner's, Freiberg's or Köhler's disease of the second and third metatarsal bones occurs in young adults, and, along with the condition known as "march fracture", is probably the result of abnormal weight-bearing through the second and third metatarsal bones.

The normal principal weight-bearing points of the foot are the heel and the first and fifth metatarsal heads. More weight than usual is borne by the second and third metatarsal heads in the following circumstances: (i) When developmental abnormalities, such as *metatarsus primus varus* and *metatarsus ataviticus*, are present; (ii) when a person undertakes excessive walking, such as a long route march or a long walk through the country, during which the anterior arch collapses and weight is borne by structures unaccustomed and unsuited to it; (iii) hyperextension of the metatarso-phalangeal joints.

The affected region, including the periosteum of the second and third metatarsal bones, becomes oedematous. The bones themselves are at first hyperæmic, and decalcification occurs. Later, calcium is laid down in the periosteum and tissues immediately around it, and X ray examination at this stage shows thickening of the shaft of the metatarsal bone. Considerable deformity occurs in the head of the metatarsal with the appearance of fragmentation; also changes in the joint, probably arthritic in origin, occur. A considerable body of opinion suggests that the condition is originally another example of disordered epiphyseal growth, occurring in adolescence, and that the symptoms complained of later are entirely due to secondary arthritic changes in the metatarso-phalangeal joints. Typical X ray appearances are: (i) broadening of the metatarsal head, (ii) flattening of the head and irregularity of its contour, (iii) the appearance of fragmentation of the head, (iv) increase in the joint space, (v) thickening of the shafts of the second and third metatarsal bones.

*The Pain in Panner's Disease.*

The pain is of a dull aching character, felt both under the tread and on the dorsum of the foot, aggravated by walking, and fairly well localized over the affected metatarsals. There is often visible swelling in this region, together with palpable thickening. Movements of the second and third toes may be painful, and occasionally crepitus may be elicited in the metatarso-phalangeal joints.

*Treatment.*

A carefully moulded domed insole is fitted behind the tread. This maintains and supports the anterior arch and protects the affected bones from excessive weight-bearing. If this is not successful, recourse should be had to immobilization in a plaster cast

until the pain subsides. This measure usually is temporarily successful. If it is not successful or if pain returns, excision of the second and third metatarsal heads should be done. A domed insole is thereafter worn behind the tread.

#### March Fracture.

March fracture, which is a fracture through the shaft of the second (rarely the third) metatarsal bone, occurs following such abnormal weight-bearing already referred to, and most characteristically during a route march or towards the end of a long week-end walking tour. The fracture is a pathological one occurring in hyperæmic, grossly decalcified bone. The immediate exciting cause may be trauma of a most trivial nature, such as treading on a large pebble.

#### Symptoms and Signs.

There has usually been some aching, similar to that experienced in Panner's disease, for some time previously. The actual pain of the fracture is always noted, and is of a sharp stabbing nature. Though the pain is severe, the subjects are usually able to reach their destination. The three patients that I have seen walked into the clinic, although in each case the fracture had occurred during the previous few days. There are usually local tenderness and palpable thickening in the region of the affected metatarsal bone.

X ray examination shows the condition clearly. It is always a transverse crack, and when seen is usually surrounded by callus. In fact it was this appearance which was the cause of occasional amputations not so many years ago for the mistaken diagnosis of osteogenic sarcoma.

#### Treatment.

The foot is immobilized in a walking plaster cast until radiological signs of union are complete. During this period the affected bones will recalcify. Union is usually rapid. A domed insole is worn behind the tread for a few months after the cast is removed.

#### The "Robert Jones" Fracture.

The "Robert Jones" fracture is through the base of the fifth metatarsal. It is important because it is so rarely diagnosed when the patient is first seen. It is due to indirect violence, generally an adduction-inversion strain, as a result of which the tuberosity at the base of the fifth metatarsal is avulsed.

The patient complains of quite severe pain, localized over the site of the fracture. Apart from this there are few or no localizing signs, and the lesion is usually regarded as a ligamentous one. It is because of the persistence of symptoms for two or three weeks that X ray examination is made and the fracture diagnosed.

#### Treatment.

The application of a plaster slipper, in which the patient may walk, for three to four weeks is the most satisfactory method of dealing with the lesion.

After the plaster is removed it is advisable to wear a felt ring pad over the site of the lesion, firmly strapped in position until local tenderness disappears.

#### Sudeck's or Disuse Atrophy.

Sudeck's atrophy occasionally occurs in the bones of the foot following prolonged immobilization, especially when this is necessitated by fracture or local sepsis. It results in considerable delay in the ultimate rehabilitation of the patient, and causes a real disability. It usually manifests itself clinically when weight-bearing is begun, attempts at which cause severe pain in the foot. Local swelling and œdema may occur, and there is deep tenderness on manual compression of the affected bones.

The lesion presents a typical radiological appearance, which is responsible for the term "spotted atrophy". This is due to patchy local hyperæmic decalcification, and may affect all the bones of the foot.

#### Treatment.

The condition is most intractable and taxes the patience of both patient and surgeon to the utmost. Attempts to cure the condition by the apparently logical method of increasing the activity of the part frequently cause exacerbations of the symptoms and do not appear to hasten in any way its ultimate resolution. Physiotherapy, particularly by hot and cold contrast baths, sometimes helps. Paradoxically enough, complete rest to the foot gives the quickest and most satisfactory result, which in the end is complete resolution of the condition.

When there are many different methods of treating the various lesions dealt with in this paper, it is because none of them is perfect. The procedures described are those which, in my experience, have given the most satisfactory results in the great majority of cases of each particular condition.

### PAINFUL FEET.<sup>1</sup>

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It is impossible to discuss all the problems relating to painful feet in the time at my disposal. I am therefore proposing to consider the subject of treatment in the light of aetiology and to confine my remarks to foot-strain and conditions which might be confused with foot-strain.

#### Foot-Strain.

I prefer the term foot-strain to flat-foot for these reasons: First, the deformity as described by Dr. Keon-Cohen is related to the valgus position of the foot. I prefer to keep the term flat-foot for the conditions in which the foot is flat without being

<sup>1</sup> Read at a meeting of the Victorian Branch of the British Medical Association on May 4, 1938.



in a valgus position. More important, however, is to distinguish valgus feet from foot-strain.

A valgus position of the foot is not necessarily painful. The foot becomes painful when the valgus position is increasing, and this is the condition to which the term foot-strain should be applied. I think the distinction is of some importance, because many children between the ages of two and five years are found to have valgus feet and knock-knees of the slack joint type. This condition, in my experience, is benign, and tends to disappear spontaneously soon after that age unless one of the following conditions exists:

1. The deformity is gross. I take as a standard a separation of the two internal malleoli of 7.5 centimetres (three inches) when the patello-malleolar length is 20.0 centimetres (eight inches) in a child aged four years.

2. There is bony deformity of the femur, usually due to rickets.

3. There is a familial tendency to knock-knee.

4. The *tendo Achillis* is short.

A child with the usual type of mobile valgus then can be expected to do well. I use the methods described by Dr. Keon-Cohen. Only rarely do I find need for irons or osteotomy.

In foot-strain, feet are losing posture. They may be already obviously in a valgus position, or they may not yet have reached such a position and may never do so. The point is that a patient may suffer from foot-strain although the condition of his feet is within normal limits.

I think we may look on foot-strain as a triumph of foot load over foot muscle.

#### *The Factors of Load.*

1. *Overweight.*—Overweight is a very important factor in women over forty. Frequently it will be found that a woman of this age has put on a stone in weight in the last twelve months. She weighs 75.6 kilograms (twelve stone) perhaps, and her feet had to support only 56.7 kilograms (nine stone) when she was young. Reduction of weight by the use of diet and the administration of thyroid extract is essential as a preliminary to any treatment by exercises or footwear.

2. *Prolonged Standing.*—Prolonged standing becomes a factor of great importance in the case of some men who have to stand at their work. Standing causes much greater strain than walking, which ensures regular rest to the feet. Where occupational standing seems to be a factor, this must be dealt with by the provision of a high stool before a cure can be achieved.

3. *Foot Architecture.*—The structure of the foot, despite any impression to the contrary which I may have created, has an important predisposing influence. Certain feet are vulnerable; these are the feet in a valgus position and the feet with low arches. Obviously the position of such feet throws an increased load on the muscles maintaining posture.

4. *Faulty Use of the Foot.*—The foot may be used in a faulty manner by reason of discomfort due to local lesions, such as plantar warts, *hallux valgus*, *hallux rigidus*, corns or hammer-toes. Such faulty use will predispose to foot-strain. It thus becomes important before treating any patient with foot-strain to make a complete diagnosis of the condition of the foot and to treat these local lesions concurrently with the foot-strain.

#### *The Muscular Factors.*

1. *Gradual Deterioration with Age.*—While deterioration with age is a factor in foot-strain, it inevitably overtakes every one of us, and nothing very much can be done about it.

2. *Acute Deterioration due to Disuse.*—Deterioration of disuse is a very important factor in the production of acute foot-strain, which may become chronic. Chronic foot-strain can often be traced to a prolonged period of rest in bed, whether due to a toxæmic illness, such as influenza, or non-toxæmic condition, such as fracture. A particular example is known as "port-foot". Passengers spend their time aboard ship lounging about on deck-chairs, but on reaching port rush about madly on foot seeing the sights, possibly for many hours. Acute foot-strain results. This brings us to the realization that rest is as important as exercises in the treatment of foot-strain. Exercises we must enforce; but they must not be weight-bearing exercises, until the muscles are in a condition to perform these. It would seem advisable to begin these exercises in the last week in any case of prolonged decubitus.

3. *Gradual Deterioration due to the Chronic Rest Enforced by Cramping Footwear.*—The free action of the toes is essential for healthy walking. If this free action is prevented by cramping footwear, not only is an important component of the step lost, but the muscles atrophy and foot-strain is the result.

#### *Treatment.*

A consideration of these factors will help in deciding the most efficient line of treatment, which should include adequate rest as well as exercises.

I should like to emphasize the value of manipulation in properly selected cases. At the out-patient department of the Royal National Orthopaedic Hospital we would manipulate two or three feet under anaesthesia five afternoons a week. In Melbourne suitable cases seem to be less common, metatarsalgia being the usual condition. Yet it seems worth while to bear this procedure in mind rather than to allow it to be done by some osteopathic rival. Trethowan used to say: "If you do only one thing to a foot, manipulate it."

I find very little use for supports to the longitudinal arch in these cases. They are a confession that we have failed to make the foot self-supporting, and are to be looked upon as splints.

#### *Infection.*

It is worth remembering that not all painful feet have a postural basis, but may be the seat of an infective lesion. In particular would I urge

caution in the case of young people, in whom foot-strain is uncommon, but in whom infective feet are frequently encountered. It would appear from conversations with students and house surgeons that this entity is not generally recognized. I should like your permission, therefore, to describe it more fully. It is similar to a gonococcal infection of the foot; but the patient has not got gonorrhoea. The following description is the result of an analysis of seventeen cases encountered at the Royal Melbourne Hospital. In the fully developed condition the feet are sweaty, swollen, sore and stiff.

The sweating is characteristic and is rather a constant moist clamminess than free sweating. The feet may be rather cyanotic. The swelling varies, but is typically round the heel and under the *tendo Achillis*, on the dorsum of the metatarsus and extending upwards along the line of the *tibialis posterior* tendon. The soreness also varies, but is characteristically over the medial process of the *os calcis*. It may be anywhere in the foot, especially where there is swelling.

This condition may come on at any age, but especially in adolescence. It has a rapid florid stage as a rule, and tends to burn out, leaving various degrees of foot damage, especially spurs on the *os calcis* and a rigid valgus condition.

Why a general systemic disease should concentrate on the feet can only be conjectured. Stiffness rapidly develops and affects the tarsal joints and the metatarso-phalangeal joints in varying degrees. Sometimes a typical spasmodic valgus condition develops. The X ray examination reveals only osteoporosis in areas around the *os calcis*. Sometimes the syndrome is not completely developed, so that the foot is involved in certain areas only. The most characteristic spot is the medial process of the *os calcis*. In such cases spur formation ultimately occurs.

On the other hand, the trouble may extend beyond the feet. A slack effusion in the knees and some discomfort are common. Other joints (shoulders and wrists) are more rarely affected.

Other evidence of chronic infection is shown by increase in the red blood cell sedimentation rate, a hypochromic anemia and general ill-health.

#### Treatment.

In treatment the most important thing is rest. The feet are manipulated if necessary into a good position and put in plaster. Walking is avoided. This should be maintained at least until the red cell sedimentation rate has subsided to normal and may take three months or more. On removal of the plaster weight-bearing is resumed only after a period of exercises to tone up the feet. In the meantime foci of infection are removed and general treatment is begun. General hygiene is very important and, apart from this, "Solganal B Oleosum" has seemed useful. I am not enthusiastic about vaccines.

It is necessary to distinguish these cases from foot-strain, sprains and the local lesions of

rheumatoid arthritis, and from that interesting condition, spastic flat-foot.

#### Spastic Flat-Foot.

Spastic flat-foot is a very interesting syndrome occurring in adolescents, and seems to be due to a generalized tarsal arthritis. The origin of this is the subject of dispute, mechanical and infective theories existing. There seems little doubt that both factors exist and that individual cases may have a mechanical or an infective origin.

#### A. Mechanical Causes of Spastic Flat-Foot.

1. *The Long Slender Foot.*—The frequency with which the condition occurs in the long slender foot mentioned by Dr. Keon-Cohen, where leverage is probably the factor, is very striking.

2. *Short Tendo Achillis.*—The importance of a short *tendo Achillis* was a point made much of by Trethowan as a cause of adolescent valgus and the reason for the failure of spontaneous cure. Since the heel cannot be brought to the ground, the fore part of the foot is forced up, the plantar ligaments yielding before the *tendo Achillis*. Division of this tendon may be required, as well as of the peroneal tendons, before the deformities can be corrected.

3. *Calcaneo-Scaphoid Coalition.*—Calcaneo-scaphoid coalition is more common than may be suspected, and is increasingly common when it is looked for in these cases. I overlooked my first example. The best X ray film to show the condition is taken in an antero-posterior direction, the foot being everted at an angle of 30° from the plate. Seddon found it in nearly 30% of his cases. I should not have thought it was so common, although I have seen three examples. As a normal variation the *os calcis* and scaphoid may articulate by a synovial joint, which probably causes no trouble. At other times these bones are united by a fibrous cartilaginous or bony bar, which partially fixes the subastragaloid and mid-tarsal joints and constrains their movements. Division of this bar has been practised; but, while on occasions it is successful, a subastragaloid and mid-tarsal fusion seems to be the ideal procedure, especially as arthritis of these joints is present by the time the patient is seen.

4. *Over-Use.*—C. W. B. Littlejohn refers to spastic flat-foot due to over-use as "messenger's foot". It is very interesting how frequently these patients are found to be employed as errand-boys, messengers *et cetera*. It is suggested that the recurrent trauma of over-use results in a traumatic osteoarthritis.

#### B. Infective Causes of Spastic Flat-Foot.

There are many signs and symptoms which suggest an infective origin in some cases, for example: (i) rapid onset, (ii) increase in the red blood cell sedimentation rate, (iii) X ray appearances suggesting infective arthritis rather than osteoarthritis. Such cases may well be particular examples of infective feet, a description of which has already been given. The treatment is naturally along the same lines as for infective feet.



There are many other points in which the ætiology of painful feet affects the treatment of the condition. These might and should be considered if time permitted.

#### THE HISTORY OF RENAL PHYSIOLOGY.<sup>1</sup>

By FELIX ARDEN, M.D. (Adelaide), M.R.C.P. (London),  
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Hospital.

I FEEL certain that the members of the Section of History, whom I have the honour to address tonight, must often have had quoted to them Osler's dictum:

Like everything else that is good and durable in this world, modern medicine is a product of the Greek intellect.

Whether you feel inclined to agree with this statement or not, there can be little doubt that we owe much to the Greeks. So I would begin this history with Aristotle, to whom we must give credit for discovering the fundamental fact of renal physiology—that the kidneys produced urine. Aristotle taught his pupils that urine escaped from the blood which passed to the kidney, and subsequently reached the bladder by way of the ureter. Pupils have a way of being unreceptive. The fact is noted in Aristotle's writings, but his followers forgot it. When Galen investigated kidneys long years afterwards, he was exploring new ground.

It is not easy, separated as we are by so many centuries, to decide what Galen's views on renal function really were. Between his experimental observations and his ingenious theories there is "a great gulf fixed". We know that he tied the ureters of an animal and observed that no urine entered the bladder; but in his writings he grouped the kidneys with the stomach and intestines under the category of "dependent" members, and ascribed no function whatever to them. Urine is described as "a product of the blood secreted in the portal vein and *vena cava*".

Unfortunately, Galen's ingenious theories prevailed, and Theophilus Protospatharius, a physician and captain of the guard to one of the Roman Emperors, born more than 400 years after Galen died, wrote a treatise on the urine and upheld the same faulty doctrine of its origin. And 700 years later still, in the thirteenth century, the last Byzantine writer, Johannes Actuarius, kept this teaching unchanged. Such was the influence of Galen. When he died, inquiry into natural causes stood still for 1,300 years and more. His voluminous writings, which embraced all branches of medicine, and his plausible philosophy, which could provide the ready answer at all times, became enshrined as the Bible for the anatomist and the physician. Scientific truth meant not "what was happening",

but "what was written". It was permissible to interpret, but not to question. And in those days authority had a heavy hand.

Picture a brilliant young Belgian, Andreas Vesalius, at the age of twenty-two years, occupant of the chair of surgery with the care of anatomy in the famous University of Padua. Day after day he spends dissecting such bodies as can be obtained from gallows and graveyards, and he demonstrates their structure to an ever-increasing number of students. Following venerated customs he has begun his academic labours by reading Galen, as others had done before him, using his dissections to illustrate what Galen wrote. But time after time the body on the table says plainly something different from the book. He tries to believe Galen rather than his own eyes, but his eyes are too strong for him; and in the end he casts Galen and his writings to the wind and teaches only what he himself can see and what he can make his students see also.

In 1543 Vesalius finished a book so revolutionary that timorous friends urged him not to publish it. But it appeared. The storm broke and the young anatomist could not stand before it. In a fit of passion he burnt the rest of his manuscript, gave up the chair at Padua and took the comfortable post of court physician to the Emperor Charles V. But his book travelled far, slowly winning conviction, and eventually the "*Fabrica Humani Corporis*" of Vesalius superseded the writings of Galen. None the less, kidney function was rather a puzzle to this young man and to other sixteenth century investigators. They were, after all, anatomists determined upon describing the structure of the body, which they did with great accuracy and thoroughness. Physiology was to come later. Berengar indeed noticed that when fluid was forced into the renal artery under great pressure some of it would escape from the papillæ; and Eustachius repeated Galen's experiment of tying the ureters and showed that thereon no urine reached the bladder. Vesalius himself went no further than to state in a non-committal way that "the substance of the kidney strained off from the blood both of the veins and arteries some of the serosity which gathered in the pelvis of the kidney as urine".

A century later there was living at Pisa a certain physicist named Borelli. He was interested in mathematics rather than in biology, but he wrote a book entitled "*De Motu Animalium*", which dealt with the whole range of animal movements—that is to say, not only with external movements produced by the skeletal muscles, but also with internal movements, such as the movements of the heart and other viscera and the movements of the fluid parts of the body. The book appeared after his death in 1680, and in it Borelli showed that he knew something of the molecular structure of matter. He elaborated the idea of the kidney being a filter, and actually grasped correctly the fact that the kidneys separated urine rather than secreted it. He visualized two sets of orifices or sieves placed in the arterial stream, through one of which escaped the

<sup>1</sup>Read at a meeting of the Section of History of Medicine of the South Australian Branch of the British Medical Association on April 5, 1938.

minute particles of urine and through the other the larger particles of blood, which were then collected into the renal vein. (Compare the apparatus at a quarry for the grading of gravel.)

So much for the anatomical and physical beginnings of our study. The next character to whom I would introduce you is Franciscus Sylvius, a German, who became in 1658 Professor of Medicine at Leyden. To understand him you must remember that besides being a physician he was the ancestor of all biological chemists. He published many purely chemical works, and he seems to have possessed the first university chemical laboratory. I think he was rather proud of what he could do in this laboratory, for all his biochemical writings are based on the supposition that the changes which take place in the body are but larger and more complex examples of what can be produced *in vitro*.

He elaborated Borelli's theory of renal secretion, and wrote:

Although one may reasonably suspect that the material of the urine undergoes some special change while it is being strained through the papillae of the kidneys, it seems to me exceedingly probable at least that the blood and even the chyle is, in the heart itself, through the vital effervescence it there undergoes, prepared for the secretion of the renal serosity, and that it is the completion only of the secretion which takes place in the kidneys.

And then, in a great wave of optimism, he wrote:

Although I cannot as yet fully follow out the process, nevertheless I hope to arrive at it by the process of precipitation.

Note this complete confidence in his chemical methods. The change in the blood preparatory to the actual work of the kidney itself was, he had no doubt, a mere chemical process, such as he might imitate in his laboratory, adding one clear liquid to another, and observing how a cloud of solid particles made its appearance, particles which might be strained off by a sieve such as the kidney seemed to be.

Meanwhile anatomical discoveries did not stand still. At about the same time as Sylvius was teaching in Leyden (1662), a pupil of Borelli's at Pisa, one Laurentio Bellini, published a little tract "*De Structura Renum*". He was then a mere youth of nineteen years. The Duke of Tuscany had sent to Borelli a deer to be used for anatomical purposes; and Bellini, under his master's guidance, carefully examined the kidneys. He then saw what no one had seen before, that the substance of the kidney was composed of minute tubules converging on the pelvis from the periphery. These straight tubules have since been called after him.

You will remember these names, for the men who bore them laid the foundations of renal physiology and of much besides: Aristotle, the searcher after truth; Vesalius and Bellini the anatomists; Borelli, the physicist, and Sylvius, the chemist. There was to come one greater than them all, Marcello Malpighi, of Bologna, Pisa and Messina, a naturalist, a pathologist and a practitioner of medicine, and, above all, the first histologist. He

was the first to use the newly invented microscope to examine fragments of human tissues, and in 1666 he published in a great book entitled "*An Anatomical Dissertation on the Structure of the Viscera*" what he had discovered.

In the section on the kidneys he went far beyond Bellini. He showed that in man at least the kidney really consisted of several portions which could be distinguished as masses of Bellini's tubules arranged in the form of pyramids, since known by his name. He showed also that in each pyramid Bellini's tubules ended in orifices at the summit of the papilla to form the apex of the pyramid, and further, that in the cortex of the kidney the tubules were not straight as Bellini had described them, but curiously and irregularly twisted. Lastly, he pointed out that many of these tubules seemed to begin as inflated swellings or capsules "round like the eggs of fishes", and that these capsules contained a knot of blood vessels, and so hung on to the small arteries "as apples hang on to the branches of a tree". And he stated his conviction that these capsules must play an important part in the secretion of urine.

Thus in 1666 Malpighi had arrived at a clear conception of the structure of the kidney; and from that date our knowledge of the organ remained where he left it, until in the nineteenth century Bowman took up the study again.

#### Foster says of Malpighi:

Whatever path of natural science he touched he left his mark; he found paths crooked and left them straight, he found darkness and he left light. Moreover, in everything which he did there is the note of the modern man. When we read Harvey we cannot but feel that in spite of all that he did, he in a way belonged to the ancients; while he was destroying Galen's doctrines he was wearing Galen's clothes, and speaking with Galen's voice. When we pass to Malpighi we seem to be entering the ways and thoughts of today. Doubtless Malpighi was reaping what Harvey had sown; doubtless he was also reaping what Galileo had sown; doubtless also the microscope gave him a tool which none before him had possessed. It was just the putting these three things together that parts him from the old times, and makes him the beginning of the new.

Investigations into the composition of the urine came long before chemistry had developed into an exact science. The earliest attempts of Van Helmont to determine the nature and origin of the urinary constituents date from the beginning of the seventeenth century. Somewhat later Brand, the alchemist physician of Hamburg, first obtained phosphorus from the urine, while Kunkel shortly afterwards described it more exactly. At the beginning of the eighteenth century the famous Boerhaave made the first analysis of urine, which was thought marvellous at the time, but is now only of historical interest.

The most important nitrogenous constituent of urine, which received the name of urea, was first recognized by Hilaire Rouelle (1775), the younger brother of that Rouelle who was Lavoisier's teacher; but the actual discovery of urea was due to Cruikshank, who in 1797 first obtained crystals of urea nitrate. Scheele and Bergmann (1775-



1788) discovered the compound now called uric acid in calculi of the bladder. Fourcay and Vacquelin (1799) made a more profound study of the chemistry of urine, and particularly of the composition of urinary calculi. The first quantitative analysis of urine by Berzelius (1809) is quoted in the classical text-book of Johannes Müller.

From the point of view of the biological chemist, therefore, the eighteenth century was an active and exciting one. Histology was at a standstill, because investigators were unable to make further progress with the feeble instruments at their disposal. Physiology as a separate science had not properly begun.

The nineteenth century brought technical improvements to the microscope and the invention of the microtome. Faced for the first time with the sight of really thin slices of tissue under high magnification, delighted anatomists became aware of a new unit of structure, the human cell. There was fascination in the discovery. Every tissue was examined and cells of all shapes and sizes were described. The cell theory came to stay. In another field Graham and Arrhenius did pioneer work upon the properties of crystalloids and colloids, explored the mystery of osmosis, and described the behaviour of electrolytes in solution. Physicists, anatomists and chemists were alive and at work. The time was ripe for a physiologist to appear.

For a physiologist must be a man of judgement, an investigator, a philosopher. Building as he does upon the foundations of the basic sciences, he must be capable of discriminating good work from bad, and of seizing upon any discovery that is sound and giving it the right place in the general scheme. He must be an investigator, always curious and ready to try any new approach that may throw light on his problems. Something of this spirit was abroad among physicians in the early nineteenth century, for curiosity led Bright to examine in the mortuary the kidneys of his patients who had presented anasarca and albuminous urine, and to correlate their symptoms with what he found. A physiologist must be something of a philosopher, reaching out ahead of his time to conceptions that will clarify the workings of the body. I have mentioned the cell theory. Consider Claude Bernard's conception of the internal environment, or in later times, that of the reticulo-endothelial system, the hormonal control of bodily function, or the chemical transmission of nervous impulses. Each fresh conception, propounded by a master mind, sets hands to work anew.

In 1836, after the publication of Bright's paper, the world was waiting for an explanation of the mysterious working of the kidney.

In 1842, six years after the foundation of South Australia, the English anatomist, William Bowman, published a paper in the *Philosophical Transactions of the Royal Society*. Herein he gave a very complete description of the vascular arrangements of the kidneys and of the detailed structure of the glomerulus and tubule. By extraordinary skill in dissection he had managed to show that the capsule

of the Malpighian body, which now bears his name, was the expanded extension of the uriniferous tubule. He was thus the first to display the complete unit of renal structure.

But the greatness of his discovery did not lie in histological disclosures. It required an imaginative leap to deduce from his dissections the mechanism by which urine came. Until then the tubules of the kidneys were supposed to secrete urine as the parotid secreted saliva, a mistake which was justified by the similarity between a cross-section of the tubules and the acini of a gland. No function had been attributed to the glomeruli. Now hear Bowman's words:

The Malpighian bodies are as unlike, as the tubes passing from them are like, the membrane, which, in other glands, separates its several characteristic products from the blood. To these bodies, therefore, some other and distinct function is with the highest probability to be attributed. The peculiar arrangement of the vessels in the Malpighian tufts is clearly designed to produce a retardation in the flow through them. It would indeed be difficult to conceive a disposition of parts more calculated to favour the escape of water from the blood than that of the Malpighian body. A large artery breaks up in a very direct manner into a number of very minute branches, each of which suddenly opens into an assemblage of vessels of far greater aggregate capacity than itself, and from it there is but one narrow exit. Hence must arise a very abrupt retardation in the velocity of the current of blood. The vessels in which this delay occurs are uncovered by any structure. They lie bare in a cell from which there is but one outlet, the orifice of the tube. This orifice is encircled by cilia in active motion directing a current towards the tube. These exquisite organs must not only serve to carry forward the fluid already in the cell, and in which the vascular tuft is bathed, but must tend to remove pressure from the free surfaces of the vessels and so encourage the escape of their more fluid contents. Why is so wonderful an apparatus placed at the extremity of each uriniferous tubule if not to furnish water to aid in the separation and solution of the urinous products from the epithelium of the tube?

The experimental work of Heidenhain in 1874 lent support to the theory and led to the coupling of his name with Bowman's. Heidenhain, from studies on the distribution of different dyes, concluded that the glomerular capsule secreted water and those salts which everywhere accompanied water in the body, such as sodium chloride, and that the tubules eliminated the remaining solids accompanied by a minimal amount of water. This sufficed for ordinary conditions. During diuresis caused by urea or salts the extra water was also supposed to come from the tubular epithelium and not from the glomerulus.

In short, the capsule and tubules differed from one another only in degree of permeability, the tubule cells being normally more permeable to the solids of the plasma than to water. During diuresis even this difference disappeared, water coming from the tubules in larger quantity than from the capsule.

Heidenhain's modification of Bowman's theory was a retrograde step. He said in effect that the constituents of the urine were secreted by the glomerulus and tubule by "vital activity" much as the parotid gland secreted saliva. Bowman based his view on the special anatomical feature of the

kidney, the glomerulus, which he considered could only be adapted to the secretion of water; but Heidenhain removed the point of the argument by ascribing the secretion of water in diuresis to the tubules.

Heidenhain's theory, although it enjoyed much popularity, lay open to serious objections. In the first place it gave no satisfactory account of diuresis, locating the secretion of water now in the capsule, now in the tubule. Secondly, it endowed the renal cell with mysterious powers of discrimination. In a normal person there was no secretion of sugar; but an increase in blood sugar of the nature of 1 part in 1,000 was supposed to call into action the hitherto dormant function of secreting sugar in order to account for its presence in the urine.

In 1844, two years after Bowman's theory was published, Carl Ludwig put forward another view, although he frankly acknowledged the defensive strength of Heidenhain's position, which was able to offer an explanation for all possible observations by attributing them to the "vital activity" of unspecified cells. Ludwig, like Bowman, approached the problem of the kidney from the anatomical basis, but he afterwards examined it experimentally. Most of his later results were not published in his own name, but in the names of his pupils, Goll, Hermann and Ustimowitsch. This (if I may digress for a moment) was characteristic of the man.

Carl Ludwig, who held the Chair in Physiology at his own University of Marburg, at Zurich, at Vienna, and finally at Leipzig, was perhaps the greatest teacher of physiology who ever lived. He had over 200 pupils of all nationalities, and most of the younger generation of investigators in his science were trained by him. He was utterly self-effacing. Most of his important discoveries were published under the names of his pupils, some of whom (we are told) merely sat on the window-sill watching Ludwig and his faithful assistant, Salvenmoser, at work. He had a wonderful capacity for selecting themes which would make the pupil find himself. His object was to form capable investigators while carrying out his own ideas; and to this end he always mapped out the experimental problem himself, including its technical details, and usually wrote out the final draft of the paper also.

Burdon Sanderson described him as "a man utterly free from selfish aims and vain ambitions, who was scrupulously conscientious in all that he said and did, who was what he seemed to be and seemed what he was and who had no other aim than the advancement of science".

At first Ludwig thought that Bowman's capsule was a simple filter which allowed all the constituents of the plasma to pass through it, except the proteins, and that in the tubules this filtrate was elaborated into the urine by the return of much of the fluid into the blood by simple diffusion. This meant that the solids would have to bear the same proportion to each other in urine as in blood plasma—an untenable view. He then explained the

change in the ratio of urea and chloride in the urine from that prevailing in the blood by supposing that chloride permeated the epithelium of the tubules more readily than urea. But filtration and reabsorption always remained for him simple physical processes independent of any vital activity on the part of the cells.

Heidenhain, weak as the reasoning may sound today, could not agree with Ludwig for one thing because of the results of constriction of the renal vein. Ludwig himself had shown that, while raising the aortic blood pressure increased the volume of urine, oliguria occurred when the renal vein was constricted. This procedure, argued Heidenhain, ought to have increased the glomerular pressure and so have increased the urine if Ludwig had been correct. According to his own view the oliguria could be ascribed to depression of vital activity as the result of venous stasis.

I quote this as an example of the futility of the controversy which raged between the Ludwig school and the Bowman-Heidenhain school for some seventy years, which was brought to a close only by Cushny's enunciation of the "modern theory" in 1917. The two schools stood for mechanism and vitalism at a time when the conflict between those rival philosophies was at its keenest. But no point would be served by my recounting the ingenious experiments and arguments devised to strengthen one or other position. Cushny published his monograph on the secretion of urine during the War. The fact rather appeals to me. I am glad to think that amid all the turmoil and widespread insanity of war there was to be found a man who could sit in his laboratory and quietly ponder on the functions of the renal tubules. He sifted and correlated all the work of any value that had gone before him—402 papers, and three-fourths were in German. The "modern theory" was a compromise. It accepted the general scheme of filtration and reabsorption of Ludwig, but, appreciating the inadequacy of the known physical forces, supplemented them as far as was necessary by the vital activity postulated by Heidenhain.

#### To quote Cushny:

The blood pressure in the glomerular capillaries suffices for filtration and the capsule filters off the colloidal substances of the blood plasma to which it is impermeable, while allowing the rest of the constituents to pass through without alteration in their relative concentrations. The glomerular filtrate is thus practically deproteinized plasma. In its passage through the tubules this fluid is altered by the absorption of certain of its constituents by the epithelium. The passage of the absorbed water and solids of the glomerular filtrate through the epithelial layer entails the expenditure of energy by the cells; it is an active absorption, not the passive diffusion which was believed by Ludwig to be sufficient. The modern view thus ascribes the function of the kidney to known factors except the reabsorption in the tubules, and that is reduced to the simple and unvarying propulsion of a definite solution through the epithelium towards the blood. It is thus a negation of vital secretion in the capsule, and, like all negations, cannot be proved directly.

Cushny, you will notice, was a peace-maker, but still a mechanist in outlook.



That was the position twenty years ago. After Cushny's monograph appeared the trend of experimental work altered a little. Perhaps the post-war physiologists were less interested in philosophical problems; certainly less was heard of vitalism and mechanism. Nevertheless, the "modern theory" came in for a good deal of criticism; and as it had its champions as well as its detractors, it provided a useful starting point for further research.

There is time to tell you of two men of this post-war period and something of their work. In 1922 A. N. Richards, sometime professor of pharmacology in the University of Pennsylvania, conceived the brilliant idea of applying Krogh's technique for visualizing capillaries to direct examinations of the kidney of the frog. As a result he observed that the glomeruli were not constantly active. They often remained bloodless for a considerable period of time, and on occasions not more than 10% of them would be functioning simultaneously. And even when a glomerulus was in a state of activity, the individual capillary loops in the tuft could be seen to open and close rhythmically, a phenomenon which Krogh had previously noted in the capillaries of the skin.

Richards's fame hangs upon the fact that he managed to insert into the glomerular capsule of the frog fine quartz pipettes, and so collected samples for examination. Microchemical methods applied to the drop of glomerular fluid obtained proved it to be a protein-free filtrate of the plasma.

There had been a controversy about experiments dealing with the excretion of dyes ever since Heidenhain's claim that they were extruded into the urine by the cells of the tubules. After the intravenous injection of indigo carmine, Heidenhain had been unable to demonstrate any dye in the glomeruli; but he had found a large quantity both in the lumen and within the cells of the tubules. This had seemed conclusive proof of tubular activity. However, Richards was able to show that a whole list of dyes (indigo carmine, sodium carminate, methylene blue, toluidine blue, typan blue), when injected intravenously, could be recovered by means of his pipette from the glomerular fluid of the frog.

Quite recently Richards has mastered the technique of introducing pipettes into the lumen of the tubules and has made direct microchemical analyses of tubular contents.

The other name I would have you remember is that of Rehberg, who emphasized the importance of diffusion. His modification of Cushny's theory, which was published in 1926, remains the current teaching today. Rehberg studied the excretion of creatinine, making serial examinations of the blood and urine, and discovered that after large injections of this substance its concentration in the urine might be 200 times that in the plasma. Assuming that no creatinine had been extruded by the cells of the tubules, a concentration ratio of 200 meant that every ten cubic centimetres of urine passed represented two litres of glomerular filtrate, 99.5% of which had been reabsorbed. (These figures are less

startling in the light of Rehberg's calculations that the total filtering surface of the glomeruli is 0.9 square metre and the total reabsorbing area of the tubules 1.76 square metres.) Using the creatinine concentration ratio as a measure of that of the urine as a whole, Rehberg found that the amount of urea in bladder urine was often only about half of what could be calculated to have escaped from the glomeruli; and although the percentage of urea in the urine used to rise as the urine became more concentrated, the ratio between urinary urea and blood urea never increased as rapidly as the creatinine ratio. This proved that the more the kidney attempted to concentrate the urine by the reabsorption of water, the less it was able to prevent urea diffusing back into the cells of the tubules.

Rehberg's theory runs as follows:

Large volumes of filtrate are formed in Bowman's capsules. This filtrate contains in solution all diffusible substances from the plasma. The percentage and amounts in which the non-threshold substances are excreted are determined by the amount of filtrate, the concentration index of the urine, and the ease of back diffusion. As the concentration index rises the concentration ratios of the various substances rise too, but at different rates. The group of non-threshold substances thus includes those which may be concentrated to very different extents, from alcohol, which is not concentrated at all, to creatinine, which may be concentrated several hundred times.

For the present our knowledge of what might be termed "renal mechanics" goes no further. Many people question Rehberg's assumption that creatinine is excreted entirely through the glomerulus, and point to certain experiments which suggest that some creatinine may be secreted by the cells of the tubules. However, Rehberg's work, like Cushny's before him and Ludwig's before that, marks a definite period in our history. And with this phase passed, there is little else to come. The main points in the theory of the excretion of urine have been tested so often that what began as hypothesis is now established fact. I am of the opinion that except for a few unimportant details our knowledge of the internal workings of the kidney is complete.

Nevertheless, although there is little more to add on this side, the study of renal physiology is by no means at an end. Having concluded the struggles that beset the earlier theories of renal secretion, physiologists have had an opportunity to gain a different viewpoint on their work. Today the relationship between the kidneys and the rest of the body is regarded as more important than the intricate processes by which each constituent of the urine reaches the exterior. After all, urine is a waste product. And what matters to you and me and to our patients is that we should successfully be rid of it. Details of the way in which this is accomplished are interesting, but of minor consideration; we are more concerned with what is left behind. It would have been a calamity if, in our concentration upon an excretion, we had forgotten the organism which elaborated it. For so did the "water-casters" of the Middle Ages, who provided diagnosis and treatment upon a naked-eye examina-

tion of the urine, while the trembling patient waited for the verdict in another room.

This has not happened in our day. Physiologists are concerned with the function of the body as a whole. And if the study of the kidney as a separate entity is coming to an end, the problems that surround its regulation and control provide an absorbing field. Under what varying conditions and stresses can kidneys fulfil their duty of maintaining a constant internal environment? What extra strain causes them to break down and how is this breakdown first manifest? How much can the body do in the way of internal regulation in the absence of the kidneys? What causes the kidneys to be aware of bodily needs?

I venture to think that this change of viewpoint is one of the most important physiological happenings in recent years. The function of the kidney is not merely to excrete urine. Such a phrase hardly does justice to a process as complex as the formation of ammonia. The kidney exists to maintain constant the internal environment. Whether it does so by turning out a solution of salts or of sugar or a fluid that is almost pure water, and whether this solution be acid or alkaline, orange or the palest yellow, does not signify so long as the composition of the body fluids remains unchanged.

Therefore I would have you regard the investigations that are going on today in many parts of the world as a new phase in the history of renal physiology.

Chronologically it overlaps the period of the study of renal mechanics; but, whereas that period is ending, the history of this phase is still being written. I can do no more than introduce you to a few of the workers and to their results.

In 1919 two Americans, Marshall and Kolls, were able to show that denervation of the kidneys, by stripping of the sympathetic plexus from the renal arteries or by division of the splanchnic nerves, had a diuretic action upon the animals. For instance, after division of the splanchnic nerve upon one side the corresponding kidney excreted about five times as much urine as its fellow. Detailed analysis showed that while the total excretion of creatinine from the affected kidney was almost unaltered and the excretion of urea was increased only to a slight extent, there was a much greater loss of sodium chloride and of water. It is a reasonable inference that in health the reabsorptive activity of the cells of the tubules depends to some extent upon splanchnic influence.

There is a difference between the behaviour of a kidney which has been separated from its nerve supply, but left with its vascular connexions intact, and one which has been completely removed from the body and made to function in something as artificial as a heart-lung preparation. Such an isolated kidney excretes an extremely dilute urine. Certainly urea and creatinine are more concentrated in the urine than in the blood which is pumped through the kidney; but the degree of concentration is remarkably small. Sodium chloride and sodium bicarbonate are always less concen-

trated in the urine than in the perfusion fluid. Tubular activity is thus profoundly altered and reabsorption of water is much diminished. The production of ammonia is abolished.

Obviously the incapacity of the isolated kidney is due to something more than separation from its nerve supply.

In 1924 Starling and Verney stumbled upon the answer—the pituitary!

Their discovery paved the way for a tremendous amount of work on the effect of pituitrin, or its component pitressin, upon renal activity. It was found that the hormone had no effect upon the volume or character of the urine of normal animals under resting conditions. However, after large drinks of water, pituitrin would delay for many hours the expected diuresis. Smirk, now professor of pharmacology at the University of Cairo, who has done much work on this subject, showed that this peculiar effect of pituitrin concerned the kidney itself and that the absorption of the water and its distribution between the blood and the tissue fluids took place in the usual manner.

Experts in comparative anatomy have suggested that pituitrin exerts its effect by stimulating reabsorption of water in the loop of Henle, since its characteristic action is absent from fish, amphibians and reptiles, which do not possess this structure.

The extent to which we depend upon this hormone is shown by the rare cases of *diabetes insipidus*, whose trouble usually results from lesions of the posterior lobe of the pituitary gland or adjacent portions of the mid-brain. As you know, the volume of urine these patients pass is enormous. I well remember seeing a man at the London Hospital who claimed that he knew every public urinal between the Mile End Station and Temple Bar.

While we are on this subject, it is interesting to note that there is one case on record with the opposite syndrome. This patient had a cystic tumour in the mid-brain and presented a condition of primary oliguria which was cured by operative removal of the cyst. Its contents were capable of checking experimental diuresis in dogs. Changes in glomerular circulation by themselves alter the quantity rather than the quality of the urine. To produce qualitative changes requires control of tubular activity; and because pituitrin can produce qualitative changes in the urine we must conclude that it controls the activities of the cells of the tubules quite apart from any action that it may have on the blood vessels. It is so powerful that it can cause water to be retained in normal subjects, even when it would be in the best interests of the body to eliminate it.

Every medical historian knows that the introduction of new methods of measurement enables new fields of investigation to be opened. For a long time sodium metabolism was a closed region to physiologists, owing to the difficulties of making quantitative sodium estimations on the body fluids. The discovery that the triple salt sodium-



uranium-zinc acetate was insoluble in a saturated solution of uranium-zinc acetate unlocked the door.

An enthusiastic worker in this field, R. F. Loeb, discovered in 1933 that there was a striking reduction of plasma sodium in cases of Addison's disease. Pursuing these studies, he showed that removal of the suprarenals was followed by a diuresis in which sodium salts were lost in high concentration, the results being to deplete the body of sodium. No doubt as a compensatory measure, potassium and non-protein nitrogen were found in the plasma in higher concentration than usual.

Adrenaline could not prevent this biochemical disaster, but the cortical hormone of the suprarenal was capable of checking the outflow of sodium and allowed the composition of the body fluids to return to normal. The implication is that in ordinary circumstances the hormone exerts a constant effect upon the cells of the tubules, enabling them to perform their usual office of reabsorbing sodium salts from the glomerular filtrate.

Professor Peters has sounded a warning against the temptation to postulate hormonal control for every variety of urinary constituent. As yet we know only a few facts about two such relationships—the pituitary and water, the suprarenal cortex and sodium salts.

Another profitable line of investigation has been the experimental production of renal failure by partial destruction or removal of kidney tissue. If by these methods more than two-thirds of the total renal substance is eliminated the urine increases in volume and becomes dilute. Urea and creatinine do not accumulate if there is sufficient fluid available for their removal, but if water is restricted the non-protein nitrogen in the blood rises. Even so, there is little increase in the concentration of the urine; the polyuria continues and a state of relative dehydration follows. The inflexibility of the kidney's response is shown by its handling of salt. When withheld from the diet salt continues to escape in the urine, whereas if it is given to excess elimination fails to keep pace, and salt accumulates in the body. The production of ammonia is very small and the subject is forced to depend upon sodium and potassium for the neutralization of organic acids.

The similarity between this condition and the terminal stage of nephritis is very close, for in both the failure of tubular activity is the predominant feature. There is also a strong resemblance to the behaviour of the denervated kidney, which has led some workers to believe that renal injury brings about compensatory reactions in the direction of inhibition of the normal nervous or hormonal regulation.

Lastly, there is a growing conviction that the kidneys are controlled from some centre which is aware of the needs of the whole body. For kidneys do more than handle blindly the blood that comes to them. The urine they produce may vary considerably on different occasions, although there has been no appreciable change in the blood from which it has been elaborated. And if the working of the

kidney is not controlled from without, how can such a result as this be accounted for? In a normal rabbit one renal artery is partially ligated, while the other remains intact. The output of urine from the damaged side diminishes, but its composition is not greatly altered. The normal kidney is now removed. No measurable change occurs in the blood; but immediately the injured kidney begins to pour forth dilute urine in large quantities to compensate for the deficiency of renal tissue.

I have tried to present to you three phases in the history of renal physiology. The first, which saw the development of the basic sciences, physics, chemistry and anatomy, lasted from Aristotle until the beginning of the nineteenth century. During the second period physiologists arose who were concerned with the internal mechanics of the kidney. This phase opened with Bowman and is now almost at a close. The third or contemporary phase embraces the study of the relationship between the kidney and the rest of the body, and is occupying many physiologists today.

If I have overloaded this paper with modern work it has been because of the flood of literature devoted to the subject since the war. Professor Peters, of Yale, who modestly describes his own monograph on "Body Water" as a "brief summary" has analysed 875 papers on this aspect of renal physiology, most of them of recent date. Peters and his school are in the forefront of the battle; and if I have helped you to a clearer understanding of the present position it is largely because his writings first helped me.

If any benefit is to be derived from a study of medical history it must be the acquisition of a sense of perspective. That rich faculty, which keeps us conscious of the wood even when devoting attention to the trees, is more than ever necessary today, when so many undigested facts clog the scientific periodicals.

May I thank you for the honour of being asked to read a paper before you this evening and in conclusion recall to you the words of Fuller:

History maketh a young man to be old without either wrinkles or grey hairs; privileging him with the experience of age without either the infirmities or inconveniences thereof.

## Reports of Cases.

### RECOVERY OF THE HEART BEAT AFTER MASSAGE OF THE HEART FOR AN HOUR AND A QUARTER.

By E. NEIL McQUEEN, M.A., D.Sc., M.B., B.S.,  
Ashfield, New South Wales.

#### History.

Mrs. A., AGED thirty-five years, had given birth to four children. After the first confinement much sagging of the pelvic floor had occurred. After the fourth confinement a condition of first degree prolapse of the uterus was present. The patient was very thin and had always been of the visceroprotic type. The blood was normal, and no

abnormality was detected on clinical examination of the heart. Operation was advised and agreed to after several months of increasing distress and loss of weight.

Under open ether anaesthesia a repair operation was undertaken. An hour and a half after the commencement of the administration of the anaesthetic, the pulse having been strong up to that time, the anaesthetist reported that the pulse rate had suddenly risen to about 150 beats per minute and that respiration had ceased. The patient immediately became cyanosed, and the pupils were found to have become widely dilated. Pituitrin was given hypodermically and the operation was stopped. Artificial respiration was applied. The patient was pulseless and the heart sounds could not be heard. Adrenaline was injected through the fourth intercostal space, with no effect. A mid-line epigastric incision was made into the abdomen, the right hand was inserted, and an attempt was made to massage the heart through the diaphragm. The heart could not be felt. The second and third fingers were pushed through a weak spot in the diaphragm, and the heart was found to be collapsed, quite soft, and with no sign of contraction or tone. After complete emptying of the ventricle (so far as could be judged), slow filling could be felt, but no sign of contraction. Meanwhile artificial respiration was carried on and oxygen was delivered continuously.

After about half an hour very weak and rapid contractions of the left atrium could be felt, long after all hope of resuscitation had faded. Massage was continued. After a further ten or fifteen minutes a hardening could be felt in a small area of the lateral wall of the left ventricle. A few minutes later fibrillary movements and very slight fluttering contractions of portion of the lateral wall of the left ventricle could be felt. Digoxin, in a strength of 0.5 cubic centimetre in ten parts of saline solution, was injected into the heart, the needle being guided by the fingers in contact with the heart. A slight increase in the amplitude of the ventricular twitchings followed. At this stage the patient made several convulsive gasps. At intervals further injections of digoxin were made. On the third occasion the point of the needle was guided into the ventricular wall near the apex, the injection being made partly into the wall and partly into the lumen of the ventricle. Immediately normal tone returned to the heart muscle and regular contractions ensued, the radial pulse becoming palpable at a rate of 130 per minute. It was now about an hour and a quarter since cardiac massage had been commenced. Respiration had meanwhile been established. The wounds were now rapidly closed and the patient was returned to the ward. In spite of every effort she died six hours later.

#### Comment.

It is thought that this case may prove of interest in view of the extraordinarily long interval during which the heart was not beating and the patient to all intents and purposes was a corpse. In the absence of an autopsy I am inclined to believe that the sudden cardiac failure was due to pulmonary embolism.

## Reviews.

### MATERNAL MORTALITY.

In "The Truth about Childbirth" Mr. A. M. Ludovici has demonstrated that the scientific layman may make a valuable contribution to the study of maternal mortality.<sup>1</sup> He deals with it as a sociological rather than as a medical problem, discussing such social questions and conditions

as age at marriage, diet, over-eating, laziness, exercise, fresh air, posture at delivery, athleticism, modern dancing, the prevailing feminist outlook (faulty in his view) and the current depraved taste shown in mating. He has something valuable to say on all these points. Acquainted with several languages, well read in obstetrics, both orthodox and heterodox (with a predilection for the latter), and experienced in animal labour, he propounds views which deserve consideration.

He justly attacks the medical profession for its willingness to accept the average labour as a normal or standard labour, but shows no understanding of the obstetrician's difficulty in escaping a sense of the inevitability of the "average" and his tendency to accept events as they are. Unlike the medical critics who write reports blaming individual doctors for the high maternal death rate, he recognizes that the premarital health of the mother is of the greatest importance to the physical success or failure of motherhood. He believes that a normal labour is both painless and pleasurable, that much of the inefficiency of present-day child-bearing is due to the late age at which women marry, and that the most propitious age for marriage is between sixteen and twenty-two. He makes a good enough case to render it desirable that the relation of the age of mothers to the character of maternity should be specially studied. His criticism of athleticism for women is also interesting.

Feminism and the freemasonry of women are his bug-bears; yet, though probably disagreeing with many of his statements in detail, no woman or medical practitioner, whether feminist or not, can deny that the physical basis of sound motherhood is dependent on sound health, which in its turn depends on a correct mode of living and a right attitude to life and its problems, or that the business of the medical profession is to find out, to apply, and to teach the good life, and not merely to deal with the failures.

## Notes on Books, Current Journals and New Appliances.

### LOOKING BACK.

ROBERT HENRY TODD, barrister-at-law, doctor of medicine and a keen musician, came to New South Wales with his wife in 1887. As Mrs. Todd was a woman endowed with literary gifts, it is no matter for wonder that the couple had a wide circle of friends and acquaintances among those who lived the life of the arts and sciences. The passing of Todd in December, 1931, left a big gap in the community.

Mrs. Todd has now presented us with a charming little volume of early recollections under the title "Looking Back".<sup>2</sup> It is well produced and contains apt personal drawings of a medley of persons, distinguished and less distinguished, among them Queen Mary, Lady Carrington, "King Peter" of the Clarence River aborigines, Sappho Smith, Mrs. Brown Potter and many others.

Not only does Mrs. Todd tell us of the men of medicine who welcomed the charming pair to Australia and made them lifelong friends, but from her varied experience in literary, social and journalistic circles she also gives delightful pen-pictures of the character and foibles of contemporary journalists, of Australian musical and stage celebrities and of the many overseas artists who have appeared in this country.

This is a readable little volume, interesting to all, but especially so to the "not so young".

<sup>1</sup> "The Truth about Childbirth: Lay Light on Maternal Morbidity and Mortality", by A. M. Ludovici; 1937. London: Kegan Paul, Trench, Trubner and Company Limited. Demy 8vo, pp. 109. Price: 10s. 6d. net.

<sup>2</sup> "Looking Back: Some Early Recollections", by Mrs. R. H. Todd; 1938. Australia: The Snelling Printing Works Limited. Demy 8vo, pp. 50, with illustrations. Price: 2s. 6d. net.



## The Medical Journal of Australia

SATURDAY, AUGUST 27, 1938.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction, are invited to seek the advice of the Editor.

### THE INTEGRATION OF MEDICAL RESEARCH.

THE ever-increasing bulk of medical research literature has now reached so vast a size that it might almost be said that it is the despair alike of forestry experts and librarians. But what of the mere practitioner? Even with the reading of a few journals of a general type, which try to single out for his attention the chief features of the rapidly passing landscape, he is beginning to feel like many travellers of today: he journeys far and fast, sees much, and assimilates only a limited amount. Pessimists have even suggested that there should be a scientific truce so as to give time for reading and pondering over the advances and gains up to the present day. This heresy is, of course, unthinkable, since only by testing the validity of what we read can we even take stock. We should not be swayed unduly by the fear that buried somewhere in the quiet dusty corridors of technical libraries are germs of vital truths, lacking the field of a fertile mind and the stimulus of the sun and rain of investigation which might make them germinate into discoveries of great importance to the world.

It is probably safe to say that the medical workers of today are, if anything, rather too impressed by the results of the scientific machine in the laboratory and by the products of the printing machine in the library. Evaluation is rather what we need: a keen and just appraisal of results, a judgement of hypotheses and theories, and a translation of these into the beneficent terms of service to the community. It is perhaps impossible for the lay mind to comprehend the outlook of the doctor. Any real advance is seized upon by the whole profession with an enthusiasm which, if sometimes a trifle overwarm and generous, at least bespeaks a genuine desire to see the process of disease arrested. In some instances it is now possible to cut short certain infections by new methods of treatment, of which mandelates and sulphanilamide are recent obvious examples; and it is curious to reflect that while treatment tends to become more expensive to the public, the actual gain to the medical profession is more often reduced. Such advances are not made every day, however, and there remain many other additions to knowledge; the practical result of which in the prevention or cure of disease has to be determined by careful examination and even more cautious trial. Who is to assess these at their true value? Here we trust no mere empiric or bombast, like Paracelsus. And who is to run to the frontiers of pure science and bring back the fruits of those explorations into lands but little understood by most of us? We pin our faith to no de Mandeville, though he really did deserve to be a best-seller in his day for his inventive powers. The difficulties that abound may be simply illustrated in recent comments on current literature in these pages. Is duodenal extract of any use in diabetes? And is there a logical basis for believing that bacteria enter the blood from infected tonsils? Here are two queries on subjects of interest and importance; yet on turning to an account of some research on each of these topics we find that even earnest endeavour and honest inquiry really carry us but a short distance along the road of knowledge.

In fine, the integration of medical research is the problem of a jigsaw puzzle; but the puzzle is one of unique variety. It is capable of indefinite expan-

sion and incredibly increasing detail. We are not furnished beforehand with all the component parts, which we must in many cases find ere we begin; nor have we ever seen the finished picture, not even part of it; nor shall we ever see it completely. In fact there could be no more exacting or exciting quest than a research into medical research; an attempt to reproduce the whole picture to date would be truly a research magnificent. Even to make a rough working chart that is reasonably accurate, we require minds of several types. We need the super-technician, the man of infinite detail; we need also him who can review a wide field and make an aerial map from high elevation, perhaps lacking in detail but conveying a general idea of the topography of the country. But even more than these we need the man who can use the chart, who can steer a reasonable course in spite of the chart's defects and omissions, who knows the arts of the empiric but has his background of scientific navigation. His difficulties are greatest. It should not be hard for the leader or teacher of medicine to reach reasonably sound judgements on general topics; but it is really difficult for the man in contact with the everyday public, dealing at once with minor and major maladies, to keep a straight course, buffeted on one side by the torrent of scientific advance and on the other by the spate of commercial advertising. Does the point need labouring further that the real integration of medical research is in the end made by the general practitioner? Never was there a time in the history of the profession when it was more necessary for a very high standard of general practice to be attained and maintained. Whatever lies before us, and without political references, let us remember this: that the onerous life of the general practitioner will be of but light value to the community unless after his sound training he can be assured of reasonable freedom from financial anxiety, leisure for reading, and opportunity for post-graduate study of a really adequate and practical type. Acid critics have said that doctors are cursed with importance. We admit it. The curse descended on us at our graduation, a curse that is not known by him who does not stand at so many dawns and dusks, not

of day but of life; a curse that is lightened by the ever-springing interest of an ever-changing contest with life's elements; and a curse that is and may be a blessing to the men and women of our world.

### Current Comment.

#### RHEUMATOID ARTHRITIS AND VITAMIN C DEFICIENCY.

DURING recent years the decline of enthusiasm for the removal of every possible septic focus in rheumatoid arthritis has been accompanied by an increasing interest in the nutritional aspect of the disease. In 1927 Rowlands, noticing the frequent occurrence of atony of the large bowel in rheumatoid arthritis, suggested that vitamin B deficiency was a causative factor. Other workers have been struck by the poor nutritional state of many patients suffering from arthritis—a malnutrition resulting from months or years of inadequate diet. The suggestion that vitamin C deficiency might play an important part in the aetiology of some cases of rheumatoid arthritis was made four years ago by Rinehart and his co-workers. They noticed that the articular tissues of guinea-pigs suffering from acute or chronic scurvy, with or without super-added infection, often showed pathological changes remarkably like those seen in arthritis of rheumatoid or atrophic type. At the same time these authors presented some rather limited clinical evidence which indicated a deficient intake of vitamin C by the patients affected. The frequent occurrence of scurvy-like gingival changes in arthritis was noticed as early as 1923.

The recent chemical identification of vitamin C and the development of quantitative methods for its estimation in biological material provide a scientific basis for further study of the problem. James F. Rinehart and his colleagues have just published a series of estimations of the vitamin C content of the plasma of eighty patients suffering from arthritis and 120 "normal" persons acting as "controls".<sup>1</sup>

These observations were supplemented by detailed dietary histories and by determinations of capillary strength by Dalldorf's method as an index of latent scurvy. The vitamin C estimations were all made in the post-absorptive state and were performed on deproteinized plasma according to the original method of Farmer and Abt. A number of interesting results emerged. In the first place, though the average value for the "normal controls" was 0.7 milligramme of vitamin C in each hundred cubic centimetres of plasma, a few of them showed values as low as 0.22 milligramme *per centum*. It is significant that several of the "controls" with low levels of vitamin C in the plasma showed other evidence of latent scurvy, namely, gingivitis and lowered

<sup>1</sup> *Archives of Internal Medicine*, April, 1938.



capillary resistance. The authors consider that the optimal vitamin C value of the plasma is between 0.7 and 0.9 milligramme *per centum*. Secondly, the vitamin C content of the plasma of fifty-five patients suffering from arthritis of rheumatoid type was almost uniformly below normal, the average figure being 0.24 milligramme *per centum*. Thirteen sufferers from gonorrhœal arthritis also showed low values (0.22 milligramme *per centum*), while twelve patients with hypertrophic arthritis had normal levels.

Supplementary vitamin C, in the form of ascorbic acid or orange juice, was given to groups of the patients and healthy persons and their response was determined. The "controls" so treated were those initially showing the lowest values of plasma vitamin. When they were given 100 milligrammes of ascorbic acid per day, the vitamin levels mounted rapidly to normal, indicating that the vitamin C content of the plasma parallels the intake. In the group of patients suffering from rheumatoid arthritis a daily supplement of 100 milligrammes or more of ascorbic acid caused a gradual rise of the vitamin C level. In most cases normal values were reached in about two to three weeks, that is, after approximately two grammes of extra vitamin C had been administered. This delay was interpreted as the time taken to saturate tissues chronically depleted of the vitamin. In a few patients the vitamin C content of the plasma failed to rise appreciably even after prolonged administration of extra ascorbic acid. Analysis of the urine of one of these patients showed that large amounts of vitamin C were being excreted in spite of its low concentration in the plasma. Rinehart and his colleagues suggest that a lowered renal threshold is the explanation of this finding—an interesting possibility, allowing as it would the existence of vitamin C deficiency even when there was an abundant intake. As to the results of therapy with ascorbic acid in rheumatoid arthritis, the authors state that in most instances clear-cut clinical improvement occurred, especially in a few cases in which oral treatment was supplemented with daily intravenous injections of the sodium salt of the pure vitamin.

Rinehart and his co-workers conclude that the practically uniform finding of low vitamin C values of the plasma of their patients suffering from rheumatoid arthritis is of significance and supports the suggestion that vitamin C deficiency is an important factor in the aetiology of the disease. They do not deny that infection plays a part; in fact, the evidence of lowered vitamin C values of the plasma in such a disease as gonorrhœal arthritis suggests that infection may be an equally important factor. Rather do the investigators contend that deficiency of vitamin C predisposes to bacterial invasion, especially of the articular tissues. In view of the now well-known fact that almost any infection will depress the vitamin C content of the tissues, the most natural question arising from Rinehart's work is this: Are the observed low values a cause or an effect? Rinehart

believes that none of his patients was suffering from a degree of infection sufficient to cause vitamin C depletion. Indeed, most of them were ambulatory and nearly all were afebrile. Rinehart considers that the occurrence of atony of the large bowel in rheumatoid arthritis may be due to deficiency of vitamin B, since in practice vitamin inadequacies are likely to be multiple. Lack of vitamin B would help to explain the great loss of appetite displayed by these patients, and the anorexia in turn would lead to further nutritional deficiencies.

This work, though obviously not conclusive, leads to interesting speculations. Unfortunately it is unlikely that this all-too-common disease may be cured simply by an adequate flow of orange juice; yet to prove that any avenue of research leads nowhere, it must be thoroughly explored. Rinehart's investigations should stimulate much interesting research.

#### SULPHONAMIDE IN MALARIA.

DÍAZ DE LEÓN obtained satisfactory results from the use of a sulphonamide preparation in the treatment of a number of patients suffering from benign tertian malaria. More recently R. N. Chopra and B. M. Das Gupta have experimented with "Soluseptasine", a sulphonamide compound, in the treatment of *Plasmodium knowlesi* infection in the monkey *Silenus rhesus*.<sup>1</sup> While endeavouring to determine the safe maximum dose of the drug, Chopra and Das Gupta observed that the intravenous administration of two cubic centimetres to a monkey suffering from a mild infection with *Plasmodium knowlesi* was followed by disappearance of the infection. They inoculated another monkey with *Plasmodium knowlesi*, and when the parasite count became very high, nearly 40% of red corpuscles being infected, they injected two cubic centimetres of "Soluseptasine" intravenously. By the next day a considerable fall in the parasite count had occurred. A further dose of two cubic centimetres of "Soluseptasine" was given, this time intramuscularly. No parasites could be found in the peripheral blood for a period of twelve days after the second injection. The relapse, which then occurred, was mild and required no treatment. In previous experiments Chopra and Das Gupta had shown that when "Atebrin" was employed the relapse was as severe as the original fever and caused death unless prompt treatment was given. "The control of such an infection in the monkey by a drug is, therefore, the crucial test of its anti-malarial activity." They conclude that "sulphonamide compounds are effective specific drugs for malaria".

We hope that Chopra and Das Gupta will continue their investigation of the use of sulphonamide in monkey malaria. It will be of interest to see what effect the drug has on the relapse rate. It may be that the discovery of a *therapia magna sterilisans* in malaria is at hand.

<sup>1</sup> The Indian Medical Gazette, July, 1938.

## Abstracts from Current Medical Literature.

### BACTERIOLOGY AND IMMUNOLOGY.

#### Hæmolytic Streptococci from Human Sources.

HUGH K. WARD AND G. V. RUDD (*The Australian Journal of Experimental Biology and Medical Science*, June, 1938) describe a simple test which, with very few exceptions, distinguishes the pathogenic from the non-pathogenic hæmolytic streptococci from human sources, and which is suitable for use in an ordinary routine laboratory. The test depends on the growth characteristics of these organisms in two special media, namely, serum broth consisting of a mixture of three parts of horse serum and one part of tryptic digest broth, and serum peptone agar consisting of a mixture of diluted horse serum and neopeptone solution containing a low percentage of agar, just sufficient to suspend the developing colonies. The authors give precise descriptions of the preparation and use of these media. They have found that capsulated Group A strains grow diffusely in the serum broth and the colonies in the serum peptone agar have a feathery transparent appearance. Non-capsulated Group A strains grow flocculently in serum broth with considerable opalescence in the supernatant fluid. The colonies in the serum peptone agar are compact and opaque. Hæmolytic streptococci from human sources, not belonging to Group A, grow flocculently in serum broth without opalescence in the supernatant fluid, and the colonies in serum peptone agar are compact and opaque. Occasionally a Group A strain was found to grow in an atypical manner in the two special media. Such atypical strains were found to be unstable, throwing off characteristic capsulated variants on cultivation. The material used in this study consisted of strains of hæmolytic streptococci from various human infections outside the nasopharynx, strains from the nasopharynx of normal individuals and of patients suffering from tonsillitis, scarlet fever and diphtheria, and a series of Griffith's (1934) type strains sent to the authors by Griffith. There appeared to be good correlation between the information afforded by this biological test and that afforded by Lancefield's serological test. The authors do not state that the cultural test is better than the precipitin test, but merely that it is more suitable for use in a routine laboratory.

#### Measles Inclusion Bodies.

JEAN BROADHURST, GLADYS CAMERON AND VINCENT SAUBINO (*Journal of Infectious Diseases*, January-February, 1938) have studied measles inclusion bodies in human blood. Direct exam-

ination of films stained with a simple solution of alkaline methylene blue was found more satisfactory than the examination of films stained by complicated differential methods. The authors describe four criteria of identification in the affected mononuclear corpuscles. Up to twelve darkly staining granules, from one to two microns in size, were scattered irregularly through the cell and were found from the first to the tenth day of the duration of rash. The margins of the affected cells were irregular or "bubbly", and there were marginal concavities suggesting that inclusion bodies had dropped out at such points. Large mononuclear cells were swollen and larger than any other cell in the blood, and the nucleus failed to take the stain, while there were many small, readily staining granules in the cytoplasm, which were sometimes so numerous as to obliterate the nucleus. It was not possible to identify free granules in the plasma. Compact rounded or crescentic bodies, distinct from those described, were also seen. Minute granules in the cytoplasm were also present in cells resembling small lymphocytes. Tissue cultures were prepared, the buffy coat from measles blood, taken on the third or the seventh day of the disease, being used. The culture media were homologous plasma and normal human plasma. The granular bodies were found in the cells in large numbers, many cells having burst. The cultures did not survive transplantation when they were made in homologous plasma, but in normal plasma they could be carried on to the third transplant. The cells of the buffy coat of normal fowl plasma cultivated in measles serum, and of chick embryo implanted in measles serum, also showed inclusion bodies, while some preparations showed the crescentic bodies seen in direct smears of human blood. The numbers of granules seen in the cultures were far greater than could have been accounted for by those originally present in the leucocytes, when buffy coat was used for the inoculum. The material used in experiments with chick embryo did not contain cells from the measles blood at all. The authors suggest that the extreme alterations in the white cells due to these inclusion bodies furnish an explanation for the leucopenia commonly found in measles.

#### Local Immunity to Scarlet Fever.

GEORGE F. DICK AND GLADYS H. DICK (*Journal of Infectious Diseases*, January-February, 1938) state that if persons who give a positive skin reaction to scarlet fever streptococcus toxin contract scarlet fever some time later, the reaction at the site of inoculation may reappear, and if the test is repeated, reactions may occur at both sites of inoculation. Experiments were designed to find a reason for this observation. The test was repeated on persons who had given positive reactions, ten times the original dose

being used. The areas affected were noted, and when the reaction had completely disappeared an inoculation of one test dose was made in these observed areas and into a new area also. No reaction was obtained in the areas which had been inoculated previously, but at the new sites a positive result was obtained, indicating that local immunity had been produced by the larger dose. Portion of the material used for testing was then heated to destroy the specific toxin and was injected. The response to tests made in areas previously injected with heated toxin was positive, while there was no response to those made in areas previously injected with unheated toxin. This indicated that the reaction was specific, and not due merely to protein. Areas which had been rendered immune by inoculation with ten times the usual dose of scarlet fever toxin were injected with Schick toxin. The subject of this experiment had previously given a positive Schick reaction and the area immune to scarlet fever toxin reacted to diphtheria toxin. This showed that the area of skin had not lost the power to react. A child with no previous history of scarlet fever was tested with one skin test dose and the reaction observed to begin after four hours, to cover an area of approximately 30 by 25 millimetres, and to reach a maximum in twenty-four hours. Prophylactic scarlet fever antitoxin was then injected. A second test, made two days later, with one skin test dose in an unused area of skin, was without result. Nine days were allowed to elapse for the elimination of the antitoxin and then one skin test dose was injected into a new area of skin. The reaction commenced in one and a half hours, grew to a size of 30 by 40 millimetres, and disappeared in three and a half hours. A test made in the site of injection of the antitoxin was without result. The inference was that the antitoxin had produced a partial local immunity which had obliterated the capacity to react at the site of its injection, and had caused a more rapid development, evolution and disappearance of the skin reaction. The recrudescence of colour followed by early blanching in the area of a previously positive reaction for skin susceptibility was thought to be a specific immune reaction, helpful in the diagnosis of doubtful rashes. In repeating tests for scarlet fever the authors stress the advisability of avoiding areas of skin used for previous injections, as use of these areas may modify the reaction obtained.

#### HYGIENE.

#### Effect of Citrate and Tartrate on Experimental Rickets.

B. HAMILTON AND M. M. DEWAR (*The American Journal of Diseases of Children*, September, 1937) have



shown from studies in the laboratory of the department of paediatrics of the University of Chicago that citric and tartaric acids and the sodium salts of these acids tend to prevent the development of rickets in rats on a rachitogenic diet, and to cause healing when administered to rachitic animals. Incorporated in the rachitogenic diet in sufficient amounts, sodium citrate, sodium tartrate and sodium bitartrate furnished protection against the development of rickets. When equivalent quantities of the acids and salts were fed, it was found that the salts were slightly more effective than the corresponding acids. When animals were placed on a rachitogenic diet until severe rickets developed and the acids or the salts were then administered together with the diet for periods of five or ten days, obvious healing occurred. The factors which probably influenced the results obtained in these experiments are fully discussed.

#### The Presence of Fungi in Various Disease Conditions.

E. L. MACQUIDDY AND ELIZABETH PINKERTON (*The American Journal of Hygiene*, September, 1937) draw attention to the frequent presence of fungi in cultures from diseased tissues. Monilia has been found in the sputum of patients with tuberculosis. It has also been found in vaginal smears from patients with purulent vaginitis. Siebenmann records the finding of aspergillus in 1% of a series of cases of otomycosis and in a number of pulmonary infections. The authors have made cultures from the skin lesions and from the upper respiratory tract of patients with allergic symptoms. Various fungi were found to be present in 154 of 200 cultures. Only a few of the varieties found were known to be pathogenic. These were *Sporotrichum schenckii*, *Actinomyces israeli* and *Monilia albicans*. The authors suggest that these, as well as the non-pathogenic fungi found, may act as allergens.

#### Lung Findings in Foundry Workers.

O. A. SANDER (*American Journal of Public Health*, May, 1938) reports a survey of lung findings in foundry workers, extending over a period of four years. Fifteen thousand industrial workers were studied, including 10,000 foundry workers, half of whom had had less than ten years' foundry life. Only definite silicosis is recorded. Machine shop workers not exposed to dust served as controls. No X ray picture of these revealed nodular shadows. Seven per centum of the foundry workers had definite silicotic nodulation. These had had on the average twenty-five years of exposure. The incidence varied with the type of foundry, being 13% in steel foundries, due to the greater use of sand and sand-blasting. Among foundry workers in whom silicosis was not found, the incidence of tuberculosis was not higher than in the population as a whole. Of subjects

with silicosis, 22% showed evidence of tuberculous infection. Reactivation of an infection acquired before forty years of age accounted for the majority of cases. With silicosis progress of an infection appears to be slow and a new infection rarely occurs after forty years of age. Sand-blasting is the first hazard against which the air helmet protects. Sand-chipping and grinding of castings may generate a high concentration of silica dust. Moulding and core-making do not constitute hazards. Peritruncal fibrosis occurs in over 50% of workers, but was not regarded as presilicotic fibrosis.

#### Pellagra in California.

C. E. SMITH AND IDA M. STEVENS (*The American Journal of Hygiene*, May, 1938) have made an analysis of 520 cases of pellagra occurring in California during the years 1928 to 1935. Of 433 patients with adequate histories, 50% were alcoholics, 27% showed only a dietary deficiency, 16% had had debilitating illnesses, 3.7% were alcoholics with a history of antecedent illness, and 3.5% had had an apparently adequate diet. The proportion of males to females was six to five. Of the men, 62% were alcoholic subjects, and of the women 35%; the groups in which the disease was due to diet or illness included a higher percentage of women. Dermatitis was present in all cases. Four out of every five patients suffered from diarrhoea, a symptom which is pathognomonic in advanced cases, and from stomatitis. In more than half the patients dementia was a sequel. This was especially so in alcoholics. This finding is greatly in excess of that occurring in endemic pellagra (1.4%). The prognosis is less favourable when dementia occurs. Nervous lesions, including sleeplessness, irritability et cetera, were also more frequent in fatal cases. The triad of symptoms, dementia, diarrhoea and mouth lesions, occurred in 38% of patients, and most often in alcoholics. In 11% the disease was recurrent, the previous attack having occurred five or six years before. A feature was the low incidence in children. The morbidity rate rises steadily up to seventy years (24%). A somewhat lower age distribution for alcoholics was noted. Under forty the females, over forty the males supplied most cases. The death rate was lower in the male patients, there being 85 male for 100 female deaths. A definite seasonal distribution was noted, the cases occurring chiefly in spring. In California pellagra is not associated with residence in institutions. The fatality rate (65%) is highest when antecedent illness has been present and when alcoholism and illness are causal factors. The average duration of fatal non-recurrent cases was four and a half months, with a more rapid course in alcoholic patients. The commonest immediate cause of death was pneumonia, arteriosclerosis coming second. On death certificates

alcoholism was recorded in only one-third of the cases. The disease was predominantly urban, and the cheap rooming-house sections of the cities contributed the majority of cases.

#### Trichiniasis in Montreal.

J. H. GÉRAVAIS (*Canadian Public Health Journal*, April, 1938) records two separate outbreaks of trichiniasis which occurred in Montreal during the year 1935. In the first, one death occurred in a series of six cases; in the second there were sixty-eight cases but no deaths. Though the exact source could not be identified in either outbreak, the second group comprised persons of German extraction, who consumed various types of sausages containing uncooked pork. There was a strong familial incidence, eighteen families supplying the sixty-eight patients, fifty-two of whom were adults between the ages of twenty and fifty years. The epidemic lasted about three weeks.

#### Familial Occurrence of Rheumatic Manifestations.

FRANCES READ, A. CIOCCO AND HELEN TAUSSIG (*The American Journal of Hygiene*, May, 1938) have studied the frequency of rheumatic manifestations among the siblings, parents, uncles, aunts and grandparents of rheumatic patients and of healthy controls. A strong familial association of rheumatic patients has long been recognized, but the relative responsibility of three factors, namely, inherited susceptibility, common insular living conditions and close personal contact with a specific infection, is not known. In a study of the multiple incidence of rheumatism in the family group, thirty-three white children under fifteen years of age, admitted to the cardiac clinic during a period of six months, were compared with the same number of unselected children of similar ages, admitted to the tuberculosis clinic. Rheumatic manifestations had occurred in 15.5% of siblings of rheumatic patients and in 4% of control siblings. Parents of rheumatic patients were affected in 30.8% of cases, while 7.7% of parents of children used as controls were affected. Uncles and aunts of rheumatic children were affected in 9.1% of cases, as against 3.8% in the controls. In the grandparents the rheumatic phenomena were found eight times more frequently (18.2%) than in grandparents of the control children. While contact existed between parents and children, uncles, aunts and grandparents did not usually belong to the same household or even to the same environment. Consanguinity and a common inheritance thus appeared to be more important than contiguity and a share in a common environment. The authors remark that this strong familial tendency extending over three generations strongly suggests a constitutional susceptibility, though they admit that exposure may also be a factor.

## British Medical Association News.

### SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held on May 4, 1938, at the Medical Society Hall, East Melbourne, DR. J. P. MAJOR, the President, in the chair.

#### Painful Feet.

DR. BRYAN KEON-COHEN delivered an address entitled "Simple Procedures in the Treatment of Painful Feet", illustrated by lantern slides (see page 325).

DR. J. B. COLQUHOUN said that flat-foot was one of the common causes of painful feet, though the majority of flat-feet were painless. He instanced the bare-footed negroes in America with "rocker" feet, who were able to carry heavy loads without pain. Among the causes of foot strain or pronated foot in children were: (a) general atonia, (b) poor posture, and (c) poor musculature of the feet. When the factors of overweight and overuse affected such children the mechanical disability followed. He drew attention to the value of adhesive strapping, such as "Elastoplast", in restoring the architecture of the foot, and described how the feet were put up in dorsiflexion and maintained in that position with a long stirrup plaster strapping. He described how the shoes should be built up, and also several exercises for the feet which he had found of value. While he agreed that an anæsthetic should as a rule be used for manipulative procedures, he thought that, whether performed over a wedge or not, manipulation without anæsthesia was of assistance at times.

Dr. Colquhoun criticized the removal of the head of the metatarsals for severe and advanced metatarsalgia, and pointed out the necessity for clean removal if it was inevitable. He also mentioned the section of the fourth digital branch of the lateral plantar nerve, as practised by Sir Harold Stiles and Norman Dott at Edinburgh for metatarsalgia, and advocated exercises for extreme flexion of the toes before the employment of buttons or bars. He said that a thick pad of saddler's felt made a suitable metatarsal bar.

With reference to operations for *hallux valgus*, Dr. Colquhoun expressed decided preference for the Keller type of operation rather than the Mayo type. He had found the incision in the web, as used by Dr. Hagenauer for the Mayo type of operation, a good approach for the Keller type of operation. He mentioned *hallux rigidus* and Glissan's operation; it was useful to mould the toe to fit the usual shoe in such a way that the patient could "rock over" in walking. Dr. Colquhoun drew attention to the importance of preoperative instruction in the exercises that were to be carried out after operation.

Finally, Dr. Colquhoun briefly criticized some of the opinions said by Dr. Keon-Cohen to be obtaining at the Shropshire Orthopedic Hospital. A calcaneal spur sometimes should be excised. Apophysitis of the *os calcis* was liable to cause the assumption of the *equinus* position in walking. It was advisable in Köhler's disease of the scaphoid bone to immobilize the foot in a walking plaster for a period of between six and twelve months. The use of the "T.P.F. and wrench" was not always an innocuous procedure. He had seen fractures of the metatarsals or of the neck of the talus resulting from it. At times better results were obtainable from mid-tarsal arthrodesis. Dr. Colquhoun said that he did not employ Naughton Dunn's operation as described originally, and he thought Dunn had later modified it considerably. He considered electrical stimulation of very little value in claw-foot. He thought that Dr. Keon-Cohen had overstated the position in his reference to amputations for March fracture. Dr. Colquhoun said that he would like to hear of an authentic example in which the radiographic appearances of March fracture had led to the mistaken diagnosis of sarcoma and amputation had been carried out.

DR. W. KENT HUGHES said that he was glad to hear the inclined plane condemned in the treatment of flat-foot.

He also remarked that the outer edge of the foot was never meant to bear the weight of the body. Dr. Keon-Cohen had referred to the use of the iron and T-strap to pull up the inner arch; it was better, in his opinion, to raise the waist of the sole with a solid leather arch. Dr. Kent Hughes described an exercise for flat-foot which he had found very helpful in treatment: he instructed the patient to stand on the firm foot and to twist the body hard around the axis so formed. He stated that the most frequent cause of flat-foot was shortness of the *tendo Achillis*; lateral motion caused a falling of the talus and rotation of the *os calcis*. Metatarsalgia occurred in the early stage of flat-foot, and the pain was due to strain on the digital nerve under the head of the fourth metatarsal bone; some four years earlier he had excised the nerve for a patient with relief of the pain. In the treatment of claw-foot Dr. Kent Hughes emphasized the importance of subcutaneous division of the plantar fascia, which was a thick, strong body through which muscles and nerves and blood vessels passed. The division had to be done thoroughly, and after division of the deep septa the foot could be unfolded. It thus became unnecessary to touch the *tendo Achillis*. In *hallux valgus* there was no deformity of the bone, and it was unnecessary to remove more than the osteophytes. It was the lateral ligament of the metatarso-phalangeal joint that required division. Dr. Kent Hughes also stated that it was never necessary to remove bone in hammer-toe. The architecture of the foot had to be remembered; by weakening it other troubles were made.

DR. T. U. LEY referred to the importance of diagnosing the type and site of pain in the feet. When the condition was due to a circulatory disturbance the subject would get acute pain after walking about one hundred yards, but after stopping and rubbing the place he could go on again without pain. Manipulation of feet could be dangerous in arthritis, but was good in adhesions. In arthritis all movements were painful, but adhesions allowed of some range of painless movements. Dr. Ley did not find himself in agreement with Dr. Keon-Cohen's comment about the ætiology and treatment of spastic flat-foot. He thought that the condition was generally preceded by a sprained ankle a month or so beforehand. In the treatment of spastic flat-foot it had to be remembered that the same position of the foot was taken up in early tuberculous disease of the ankle joint, which should be excluded by means of satisfactory skiagrams before treatment was commenced. He considered that tenotomy of the peroneal tendon was not necessary.

DR. J. P. MAJOR, from the chair, thanked the speakers and invited Dr. Keon-Cohen to reply to the points raised in the discussion.

Dr. Keon-Cohen, in reply, thanked those who had contributed to the discussion for their reception of his remarks, and for the way in which they had emphasized certain features of the subject which he had been obliged to omit or to pass over inadequately. He wished to join issue with Dr. Price about flat-foot; both he and Dr. Colquhoun had referred to flat-foot as a pronated foot; actually it was supinated on the heel, which it must be to remain plantigrade. Osteotomy was rarely necessary for knock-knee, whether it was causing flat-foot or not. Knock-knee could be corrected by reduction of the space between the internal malleoli, at the rate of 2.5 centimetres (one inch) per year, by conscientious wearing of crooked heels. Manipulations were of most value for osteoarthritis and adhesions, but were contraindicated in infective arthritis. Dr. Keon-Cohen said that he had seen three patients of the type mentioned by Dr. Price, with complete bony fusion between the scaphoid bone and the *os calcis*. One had complained of symptoms; but the other two were without symptoms, and the condition had been discovered accidentally. Dr. Keon-Cohen affirmed that the after-results of Kellers' operation were far and away better than those of any other procedure. Mayo's operation was bad in his opinion, and had nothing to recommend it at all. He disapproved of promiscuous arthrodesis in claw-foot. Subcutaneous plantar fascia division and the other measures referred to by him in the paper, including the



use of Thomas's wrench, were usually sufficient. He informed Dr. Colquhoun that Naughton Dunn practically never removed the whole of the navicular bone nowadays. In conclusion, Dr. Keon-Cohen was unable to agree with Dr. Kent Hughes that bone should never be removed in hammer-toe; the joint was often completely subluxated, and after arthrodesis the foot was in no way weakened.

#### NOMINATIONS AND ELECTIONS.

The undermentioned has applied for reelection as a member of the New South Wales Branch of the British Medical Association:

Hynes, Marie Eleanor, M.B., B.S., 1928 (Univ. Sydney), 704, Pacific Highway, Killara.

The undermentioned have been elected members of the New South Wales Branch of the British Medical Association:

Price, Louis James Laurence, M.B., B.S., 1937 (Univ. Melbourne), The Rock.

Hercus, Harold Dundonald Macky, M.B., B.S., 1937 (Univ. Sydney), Ocean Island, Pacific Ocean.

Gard, John Joseph, M.B., 1933, B.S., 1934 (Univ. Sydney), D.P.H., 1938, Commonwealth Health Department, Customs House, Circular Quay, Sydney.

Duval, Robert Andrew, M.B., B.S., 1938 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

The undermentioned have been elected members of the Victorian Branch of the British Medical Association:

Goldmann, Hans, L.R.C.P. and S. (Edinburgh), L.R.F.P. and S. (Glasgow), 1937, M.D. (Berlin), "Kafore", High Street, Windsor, S.I.

McLaren-Robinson, William John, M.B., B.S., 1937 (Univ. Melbourne), Flinders Naval Depot, Crib Point.

Sewell, Sidney Arnold, M.B., B.S., 1936 (Univ. Melbourne), Pathology Department, University of Melbourne, Carlton, N.3.

## Proceedings of the Royal Commission Appointed to Inquire into Matters Pertaining to National Health Insurance.

### STATEMENT PREPARED BY THE NATIONAL HEALTH COMMISSIONERS.

Mr. J. B. BRIDGEN tendered as evidence before the Royal Commission a statement prepared by the National Health Commissioners. Part of this statement appeared in the issue of August 20, 1938.

#### THE CAPITATION RATE.

51. The capitation rate agreed upon in March last was 11s. per year per person entitled to medical benefit (as already defined). The aggregate of this sum is estimated to exceed £1,000,000 per year, each shilling in the rate being worth something in excess of £90,000 per year. Over a period of five years, which the Commissioners suggest should be the period to be covered by an initial arrangement, and during which the insured population will have increased, each shilling in the annual rate will represent a sum of about £500,000.

52. The use of existing standards of remuneration was obviously advantageous in the negotiations referred to, even if they could be used only as a basis for assessing the value of a somewhat different service. It avoided the necessity for entering into lengthy and highly controversial discussions on the value of a particular kind of service in the abstract, and on the practice expenses of such service.

53. In the negotiations two possible standards of existing contract of service were discussed, namely, the British Health Insurance capitation rate of 9s. now operating and confirmed last year by a Court of Inquiry, and the rates prevailing in Australia for Friendly Society medical service. While it was agreed that because of the differences in Australian conditions it was not appropriate to use the British rate as a standard, it is desirable to inform the Royal Commission of the considerations which arose during the discussion, as well as the considerations which led to the adoption of the 11s. rate based upon Australian usage.

#### THE STANDARD OF THE BRITISH HEALTH INSURANCE CAPITATION RATE.

54. The British rate of 9s. was discussed from the alternative points of view of its value in Australian currency and the relative practitioner costs in Australia (also in Australian currency) including all personal

expenses. It was found, however, that the British service and the proposed Australian service differed too widely in their circumstances and scope to warrant any elaborate discussion on these lines.

It is generally admitted that the standard of health is higher in Australia than in Great Britain. The proportion of married women in the insurable class will be smaller in Australia. These two considerations suggest that per insured person the service required within any given scope is more onerous in Great Britain than it will be in Australia.

55. The scope of the service in Great Britain is much wider than the scope of service which was the subject of negotiation and which is now more precisely defined. The British service includes the administering of anaesthetics and the treatment of cases which are the subject of Workers' Compensation liability. The Commissioners have been given to understand that these two services are valued by the profession in Australia at 9d. and 1s., respectively, per year per insured patient. Whatever other differences there are in scope of medical service are in favour of the Australian practitioner.

56. While it is impossible to measure exactly the effects of the differences in circumstances and scope of service between the two countries, it is obvious that the rate of 9s. now ruling in Great Britain would be reduced considerably if Australian conditions obtained. In the opinion of the Commissioners the former agreement rate of 11s. in Australian currency is at least 50 per cent. above the rate for the same amount of work and skill in Great Britain as expressed in sterling. The Commissioners believe that a substantial net increase is provided in that 11s. (Australian) over the British standard of remuneration, and in excess of any differences in expenses.

#### THE STANDARD BASED ON AUSTRALIAN FRIENDLY SOCIETY PRACTICE.

57. The existing Friendly Society medical service in Australia is sufficiently comparable in scope with the intended National Insurance service to provide an excellent basis for determining the capitation rate. The Commissioners have been given to understand that the medical profession regard their Friendly Society service

as being of a high quality. The services are widespread, they have been operating for many years, and they cover a substantial proportion of the persons to be insured, as well as many others within a similar income range.

58. Before this evidence could be used certain statistical and other difficulties had to be overcome. The chief of these arose from the fact that whereas the insurance service is to cover the insured person only, the Friendly Society service covers the dependants of Lodge members as well. These dependants include not only the wives and children of married men, but dependants of other members. Moreover, Lodge members are not a typical cross-section of the Australian community, nor are they representative of the class of persons to be insured, and they are of a higher average age than the insured population will be.

59. The remuneration limits for insured persons entitled to medical benefit were determined by reference to Friendly Society practice. For administrative reasons the Insurance limits will be determined by the current rates of remuneration of the employed contributors and not by reference to the total income received in the year. There is to be no limit for manual workers and there will be a small proportion of this type of insured persons whose earnings in a year will be in excess of the maximum of £365 laid down for other persons in the Act. There are comparable exceptions in Friendly Society practice. Either the income condition is ignored or special members are allowed by the medical practitioners to receive the service despite their incomes. The supervision of income limits cannot be very effective in Friendly Society practice. Under the compulsory system of National Insurance, when employers are required to contribute, the income limits are more likely to be respected.

In the opinion of the Commissioners the average income of the insured class will be lower than the average income of the voluntary contributors for Friendly Society medical service.

60. The Commissioners recognize that the income capacity of their patients is important to medical practitioners, and that the provision of an Insurance medical service will cause practitioners to lose some part of their earnings from private practice. Insurance medical practitioners as a whole are already receiving some part of the £1,000,000 a year which is to be paid to them from Health Insurance Funds, either from private patients or for Friendly Society service.

61. The Commissioners believe it to be quite impossible to ascertain what proportion of the insurance income will merely take the place of existing income from the same scope of service, but it is able to supply evidence of the probable proportions of various grades of income within the class of insured persons.

Estimates made from Census returns, adjusted for subsequent increases in wages and decreases in unemployment, indicate that about 90 per cent. of those within the wage and salary earning group receive less than £260 per annum. Of the remaining 10 per cent. probably one-half (5 per cent.) are receiving between £260 and £364 per annum, and one-half (5 per cent.) over £364 per annum.

62. The effect of National Insurance will be of some importance in the higher grades of these incomes. It will probably be of even greater importance in its effect on the incomes of medical practitioners in respect of the lower grades of these incomes. It is not uncommon for private practitioners to treat persons in these lower grades without charge or to receive little or no income from services given in respect of them. While the more common form of treatment of persons in the lower grades of income has been through public institutions, the extent of individual service by private practitioners outside such institutions is probably quite large.

The Insurance medical service will be provided for most of these people and will remove their treatment from the class of charitable services. The regular cash payments to be received by insurance practitioners will indeed be of considerable advantage to those of them who suffer from bad debts and costs of collecting amounts due.

63. In the negotiations now reported the chief remaining problems were as follow:

- (i) A standard annual capitation rate for Friendly Society medical service was required for Australia;
- (ii) A standard was also required for the number of persons entitled to receive medical treatment in respect of that capitation rate;
- (iii) The treatment needs of the average insured person had to be compared with the treatment needs of the average person entitled to Friendly Society medical service; and
- (iv) A value had to be assessed for the net additional service to be provided to insured persons for the National Insurance capitation rate.

For the first two of these problems some data were available and these were made the subject of statistical analyses. The last two could not be measured, but they became a subject of discussion during the negotiations.

64. A standard annual capitation rate paid by adult married male members with dependants for Friendly Society medical service was agreed upon after discussion of the analyses referred to. The weighted average for Australia of all metropolitan and other rates was 27s. for adult married males, but to meet the wishes of the representatives of the medical practitioners the New South Wales rates were used, and these gave the higher average of 29s.

65. The standard number of persons entitled to receive medical service for that capitation rate was agreed upon at 3.2 persons. This figure was based upon evidence which will be supplied by my colleague, Mr. Commissioner Green. It was found that the resulting figures coincided very closely with the estimates previously made for the information of the medical profession. It was not thought necessary at the time to investigate the matter further. But the Commission is now collecting evidence in five States covering about 150,000 Friendly Society members. This evidence is being compiled independently under the supervision of officers of the Commonwealth Statistician.

66. The treatment needs of the average insured person will certainly be less than the treatment needs of the average person entitled to medical treatment under Friendly Society service. The average age of the insured population will be about 32 years. The average age of male members of Friendly Societies is about 40 years. Further, if there is any difference between the treatment needs of Friendly Society members and of their dependants it is likely to be that the typical member himself requires less treatment.

67. The net effect of these considerations was to remove any doubt that might have existed that the treatment needs of insured persons were not adequately represented by the figures arrived at in the calculations I have just reported. If it could be established that the average number of persons entitled to receive medical treatment under Friendly Society service was only three persons instead of 3.2 per male member, the figure of 3.2 would still be a small enough figure to use for the purpose in hand.

68. The appropriate capitation rate for the same scope of service was arrived at by adopting two figures—29s. to represent the standard Friendly Society capitation rate for adult married males, and 3.2 to represent the persons treated for that rate in terms of persons to be compulsorily insured. The result of dividing the 29s. by 3.2 is to give an approximate capitation rate of 9s. After having regard to all the considerations taken into account no higher figure could be justified.

#### THE CAPITATION RATE AGREED UPON.

69. On the basis just reported it was possible to proceed to a valuation of the extra services to be supplied by insurance practitioners, less the value of the better conditions of insurance service. The discussions which took place on these questions are reported in the account of the negotiations, but this account does not indicate the extent to which the insurance service will be more advantageous to medical practitioners than existing Friendly Society service. It may be said briefly that these better conditions fall under three heads as follow:



- (i) The continuity of patients on practitioners' lists will depend much less on the continuity of their contributions under National Insurance than is the case with Friendly Society members;
- (ii) Under Insurance service all drugs and appliances supplied to patients will be paid for separately. This fact represents small specific differences in the conditions of Insurance service as compared with those of Friendly Society service.
- (iii) The Insurance service will afford greater freedom for practitioners and better conditions for determining issues between patients and practitioners than exist in Friendly Society service, in which the application of the principles that the Commissioners have set out in this evidence is not practicable.

70. The Commonwealth Treasurer and those persons who assisted him in negotiations, who include the present Commissioners, had difficulty in convincing themselves that a sum of 2s. should be added to the basic figure of 9s. for the full capitation rate. The considerations of service which influenced them in agreeing to that final figure have been explained in my earlier evidence. The Commissioners are of the opinion that a substantial margin in favour of insurance practitioners is included in the capitation rate agreed upon, and that this margin is worth at least £50,000 a year.

#### PAYMENTS TO INDIVIDUAL INSURANCE PRACTITIONERS FOR MEDICAL SERVICE.

71. The distribution of the aggregate sum to the credit of the Medical Service Account involves in the first place two types of payments to individual practitioners, as follows:

- (i) The fee payable to each insurance practitioner in respect of each insured person on his list for service. This is called a "capitation fee" and is distinct from the capitation rate previously discussed;
- (ii) The remuneration payable to insurance practitioners who treat insured persons not on the lists of practitioners who treat them. These persons will usually be temporarily in the district served by the practitioner who treats them.

These payments will be distinct from all travelling allowances, which will be the subject of separate provision outside the Medical Service Account.

72. As is stated in the report of the negotiations at Melbourne, it was then agreed that the details of the Medical Benefit Regulations (which would include the basis of distributing remuneration to insurance practitioners) should be worked out in consultation with representatives of insurance practitioners. In view of events subsequent to those negotiations, this stage was not reached and it now becomes necessary to devise a system of distribution. The main problem of distribution is to provide suitable adjustments to take account on the one hand of persons whose names are not on any insurance practitioner's list, and, on the other hand, of the payment for treatment rendered to persons while away from their usual places of residence (in respect of whom, therefore, the insurance practitioners in the home area are temporarily relieved of their responsibility for giving treatment). It is clearly impossible both to pay the full capitation rate in respect of all insured persons while in their home area and also to provide payment from the same capitation rate in respect of treatment that they receive while absent from that area. It therefore becomes necessary to make provision, from the aggregate amount of the capitation rates for all insured persons, for these two purposes.

73. The Commissioners suggest that the capitation fee payable in respect of each person on each practitioner's list should be based on an annual sum 1s. less than the annual capitation rate credited to the Medical Service Account for ultimate distribution among insurance practitioners.

74. It is intended that the annual amount of the capitation fee shall be divided by four and that a quarterly capitation fee shall be paid to each practitioner in respect of each insured person on his list at the commencement of each quarter.

75. The Commissioners suggest that the remuneration payable for the treatment of persons not on the lists of the practitioners who treat them should be the subject of consideration and report by a Committee representing medical practitioners such as is contemplated in Section 60 of the Act.

It is proposed that this remuneration should be known as "Case Values".

76. It is intended that the balance to the credit of the Medical Service Account after all capitation fees and case values have been paid shall be distributed among insurance practitioners in proportion to the capitation fees already paid to them, or in such other manner as may be determined after consultation with the suggested Committee. In view of the fact that the capitation rate is based on an average of Friendly Society rates in both metropolitan and country districts and is, therefore, rather in excess of what would be equitable for metropolitan areas only, insurance practitioners may desire to limit the distribution of this balance to practitioners outside the metropolitan areas.

77. The insured persons in respect of whom the capitation rate is credited to the Medical Service Account will comprise four main classes in relation to medical service, namely:

- (i) Persons on the lists of practitioners and receiving treatment from them;
- (ii) Persons receiving treatment who are not on the lists of the practitioners who treat them;
- (iii) Persons on the lists of practitioners, but who are not receiving treatment; and
- (iv) Persons neither receiving treatment nor on any practitioner's list.

78. The principles of this proposed system, while based on the main principles of the British system, differ from the details of that system in several important particulars, and in the opinion of the Commissioners are appropriate for Australian conditions. Their objects are:

- (i) To establish methods which will be simple in all their essentials, comprehensive, and capable of being adapted in detail to suit the wishes of insurance practitioners;
- (ii) To provide insurance practitioners as a whole with a definite income for the medical services to be supplied by them and in respect of all persons entitled to that service;
- (iii) To provide each individual insurance practitioner with a minimum income in respect of each insured person on his list;
- (iv) To provide adequately for payments for the treatment of persons away from their homes or whose employments require them to leave their home districts from time to time.

I desire to emphasize that insurance practitioners collectively will receive the whole of the amount credited to the Medical Service Account, based on the capitation rate.

79. A crude example will serve to illustrate how this suggested system may work in practice. Certain assumptions can be made with respect to 1,000 insured persons representative of the whole. A capitation rate of 11s. per insured person will credit the Medical Service Account with £550. There will always be some insured persons not on any lists and not in receipt of Insurance Medical Benefit. It can be assumed for this example that 10 per cent. of the insured persons do not apply to be placed on any insurance practitioner's list, although some of them may be itinerant workers receiving treatment as required.

80. The sum of £550 available, divided by the number of listed persons (900) provides an amount of 12-2s. per listed person, on which the first charge is 10s. per listed person. This payment will cost £450, leaving £100 available to be used for Case Value payments and for

ultimate distribution. The practitioners who receive the Case Value payments will receive them as the first addition to the 10s. After the Case Value payments have been made the balance will be distributed amongst the whole of the practitioners in proportion to the original payments.

Thus the original payment of 10s. per listed person will be increased in either of two ways or in both of those ways.

81. It is, of course, possible that the Case Value class of service might be unexpectedly costly, and that the proportion of this class of service may be too large for the equitable working of the system. In the example given the margin available for both Case Value payments and additions to the capitation fee is more than 18 per cent. of the sum originally available. If it should happen that the Case Value payments absorb so much from the Medical Service Account that there is not sufficient to add materially to the capitation fee, then the whole situation will need to be reviewed and the Regulations varied.

82. It may be that to secure equity amongst themselves insurance practitioners will desire to elaborate the system here proposed, and perhaps to place limits on the additions to be made to capitation fees where persons on the practitioner's list have received treatment by some other practitioner. It would be equitable to introduce such a refinement (if it were thought necessary) because Practitioner A, who has the person on his list, has been relieved of some of his duty by Practitioner B, who will have been paid specially for that service. The Commissioners suggest that such problems should be considered and reported upon by the practitioners themselves through a representative committee.

#### COUNTRY PRACTITIONERS.

83. In the agreement arrived at with the Executive Committee of the Federal Council of the British Medical Association no discrimination was made in payments for services as between practitioners in metropolitan and other areas, such as is usual in Friendly Society contracts. The chief reason for this was that special travelling allowances were also agreed upon, which included payment for time, and which were intended to be part of the insurance service incomes of country practitioners. The Commissioners have been given to understand that charges made in private practice for travelling are at present recognized as parts of the incomes of many country practitioners.

84. As I have already stated, it is the intention of the Commissioners, in pursuance of the Act and of the declared policy of the Government, to extend the insurance medical service as widely as possible through the sparsely settled areas of the Commonwealth. The object of this policy is not only to provide a service for insured persons, but to retain and attract competent practitioners for rural areas so that all persons in those areas may benefit from the facilities thus made available. The methods of carrying out this policy will not be restricted to the proposed arrangements now under review, but these proposed arrangements have been designed to go as far as seems to be reasonable along their lines.

The cost to the Health Insurance Fund of travelling allowances is anticipated to be about 10 per cent. of the cost of Medical Service.

85. I may remark here that the majority of well qualified country practitioners who would undertake service under these proposed arrangements will probably find that their capitation fee income will not be the major part of their total practice income, which will be derived from four main sources, namely:

- (i) The capitation fee for insurance medical service, plus Case Value payments if any and a share of the balance in the Medical Service Account;
- (ii) Allowances for expenses and for time which may be spent in travelling;
- (iii) Income from fees received from or in respect of insurance patients for services outside the scope of insurance service, e.g., Worker's Compensation cases and the like, occasional major surgery, and confinements;
- (iv) Income from other private practice.

86. It may be noted that in the course of travelling an insurance practitioner will usually visit a number of patients for treatment, and that some of these patients will be outside the range of insurance service. The mileage actually covered especially for each insurance patient will be much less than the mileage upon which it is proposed to base the payments now to be discussed.

#### TRAVELLING ALLOWANCES OR "MILEAGE".

87. The proposed system of travelling allowances and the amounts to be credited in respect of them by the Commission were discussed and accepted during the negotiations of March last, and formed part of the agreement then reached. The system is in effect a supplementary capitation system related to the distances between the nearest insurance practitioner and the places of residence of the listed insured persons within some given area, less a distance which is normally within the usual travelling range of general practitioners in closely populated areas. This distance has been fixed at three miles.

88. The system will not be confined to rural areas, and in certain districts where travelling is particularly difficult or costly the Commissioners may provide a special subsidy to assist the local insurance practitioner.

89. The same objections obtain against the payment of travelling allowances for actual travelling as obtained against the service payments for actual attendances. Such methods would require too much regulation and recording.

90. The principles of the agreed system were that a practitioner should be paid a definite sum each quarter for mileage in respect of all relevant insured persons on his list, that this payment should be based on an assumed number of visits to each of these persons, and that the payment should cover two things, namely:

- (i) the estimated expenses of travelling; and
- (ii) a value assessed for the practitioner's time while travelling.

91. There is no Australian experience on which to estimate the probable visiting requirements per listed insured person. The system may encourage the listment of persons who may never trouble the insurance practitioner at all. The general condition of health in Australian country districts and the habits of bushmen and others are not such as to justify any expectation that the practitioner will be called upon to make many special visits for services within the scope of his medical treatment.

92. It was noted that the number of visits paid by insurance practitioners in Great Britain per listed insured person for 1936 was 0.76. In the absence of local evidence and in pursuance of the desire to encourage country practitioners it was decided to make a generous allowance of one visit per listed person per year.

93. Evidence was collected from a variety of sources, public and private, on the inclusive expenses of travelling by car in country districts, and on allowances made to persons for such expenses. In no case did the allowances amount to 6d. per mile, but in view of the circumstances of some practitioners the amount of 6d. per mile was adopted.

94. There remained the question of the value of time assumed to be spent in travelling. This would sometimes be time that could otherwise be occupied in earning income, but it will often be chiefly a contribution towards income that could not otherwise be received.

95. A rate of 6d. per mile was adopted as a rate of payment for time assumed to be spent in travelling, and on the following assumptions. It was assumed for this particular purpose that the time to be paid for should be valued on the basis of forty-eight hours per week for fifty weeks in the year for an annual income of £1,500. The hourly figure is 12s. 6d. It was further assumed that the average speed of travelling would be twenty-five miles per hour. This gave the value of 6d. per mile.

96. These two items amount to 1s. per mile, and it is intended that this rate should apply to the whole of the journey both outward and homeward, except for the omitted distance of three miles. This basis is a con-



venient and simple one, although it implies an artificial assumption that the practitioner makes no other calls on the journey, and that each visit is a special one.

97. The Commissioners intend to establish a Mileage Account within the Medical Benefit Account, and distinct from the Medical Service Account, to which shall be credited the amounts calculated as due for mileage under the system here described, subject to certain limits as to maximum distances and to safeguards that may be necessary to avoid abuse. This account will be credited with 2s. for every mile by which a listed person is distant more than three miles from the residence or other visiting base of an insurance practitioner.

98. The distribution of the amount to the credit of this account may require a system to include Case Value mileages somewhat similar to the system described in relation to the Medical Service Account. The Commissioners suggest that it may not be necessary to proceed further at present with such details, and they would prefer to leave the subject as open as possible until after the proposed committee has had an opportunity of conferring with them.

99. I give an illustration of how this system will operate. Assume 100 persons residing in a country district and located at varying distances from the nearest medical practitioner. Fifty persons reside five miles distant from the practitioner's surgery, 25 a distance of ten miles, fifteen a distance of fifteen miles, and ten a distance of twenty miles. The insurance practitioner in such circumstances will receive these annual payments in addition to capitation fees:

	£	s.	d.
50 fees at 4s. each .. .. .	=	10	0
25 fees at 14s. each .. .. .	=	17	10
15 fees at 24s. each .. .. .	=	18	0
10 fees at 34s. each .. .. .	=	17	0
100 fees totalling .. .. .	£62	10	0

In the case assumed the average payment in respect of mileage fees will be 12s. 6d. per insured person in addition to the capitation fees for medical treatment.

#### CHARGES TO INSURANCE PATIENTS.

100. Paragraph 5 of the Terms of Reference distinguishes between payments which Insurance practitioners may require from insured persons—

(a) In respect of services rendered in pursuance of contracts made by them under the Act; and

(b) In respect of services rendered otherwise than in pursuance of such contract.

(a) refers to service within the scope of treatment and (b) to service outside that treatment.

101. The Commissioners take the view that while a service may be within the scope of treatment it may be outside the conditions of service. The relevant conditions are those of attendance or of visiting or of notice in respect of visiting. It will not be part of the scope of service of an insurance practitioner to attend upon or to visit patients outside the prescribed hours, or unless due notice has been given before the prescribed time requesting any visit. It will be within the scope of the practitioner's service to attend upon or to visit patients whose condition requires immediate attention, irrespective of the conditions which apply to ordinary service. The insurance practitioner can at the time be the only judge of the patient's physical condition and of his actual requirements.

102. The question which arises is whether in doubtful cases the insurance practitioner should be at the mercy of his insured patients, or whether the patients are to be at the mercy of their insurance practitioner. Doubtful cases cannot be avoided, and they are bound to evoke complaints and disputes. The Commissioners hope that procedure and the usage of insurance service will be such that these causes of friction will be reduced to a minimum. At present the Commissioners are not inclined to prescribe rules and amounts of permissible charges to be made

when insured persons abuse their rights to obtain medical service, nor will they be disposed to take any action until experience is gained and the problem can be discussed with the Medical Benefit Council.

103. The Commissioners propose at present to regard all such charges as being for service outside the scope of the insurance practitioner's service. However, the Commissioners are of opinion that when charges are made in respect of treatment within the scope of insurance treatment, the Commission should be informed of all the relevant facts through its appropriate officers.

104. With regard to medical treatment outside the scope of insurance treatment the Commissioners take the same view, but it will be a duty within the scope of insurance service to advise insurance patients of the treatment required and to inform them of any facilities for such treatment available in public institutions.

105. I desire to repeat that the Commissioners recognize that many general practitioners are qualified to undertake some of the specialist services which are excluded from the scope of insurance treatment. Not all of these are specialist services in the ordinary sense of the term. Further, a qualified specialist is not necessarily a specialist only, nor as a rule can he be a specialist only except in the larger centres of population.

106. In the interests of insured persons the Commissioners will welcome any reasonable plan which will impose a salutary discipline within the medical profession directed to safeguard the interests of patients generally, and to restrain the zeal of any practitioner who may be tempted to experiment with treatment beyond the range of his competence. It is the desire of the Commissioners that any restrictions which may be imposed by such discipline shall be determined by insurance practitioners themselves.

#### THE PERIOD BEFORE REVIEW.

107. The Terms of Reference invite the Royal Commission to recommend a period during which its recommendations should operate. The Commissioners recognize that the original scope, conditions, and terms of service may be modified in due course, and that they will be to some extent experimental. The March agreement was accepted on behalf of the Government with these facts in mind. Allowance was made for difficulties which will arise in the early stages of service, when the insurance medical service will not cover the treatment of pensioners. By the time that insurance pensions have matured and insurance pensioners are being provided with medical service, the system will have been well established and the two considerations will probably cancel one another.

108. The Commissioners suggest that a period of five years will be the shortest period during which sufficient experience can be gained and sufficient evidence established to enable a comprehensive review to be made. The first year of service will provide no evidence suitable for use in any such review. It will take time for the system to get into working order. The second and third years will be the only years the experience of which can be recorded and examined in full detail for use in framing any terms which will begin to operate five years after the commencement of the service. The fourth year will be occupied with the collection and the examination of evidence for any revision.

It is not customary to review such conditions of service at frequent intervals, and there is much to be said for stability in the interests of the insurance practitioners themselves.

#### CONCLUDING REMARKS.

109. There must of necessity be a good deal of reasonable give and take in any arrangement for the supply of insurance medical services, and the Commissioners in this evidence have not set out to review comprehensively the whole of the many minor matters which may become important to individual practitioners in special circumstances. If an attempt were made to prescribe for every variety of circumstance the conditions of service would

become so involved as to be in effect unworkable. I believe that the minor considerations not covered in my evidence will be found to balance out quite well and to be without any trend of bias against insurance practitioners. I hope that the spirit of the suggestions which I have made in this evidence will commend itself to members of the medical profession, and also the desire of the Commissioners to keep the conditions as free and open as possible.

110. I believe also that the only important differences between members of the medical profession and the Commissioners are in regard to payments to be made. There has been a certain element of fear in the minds of practitioners that our proposed payments would depreciate the status of the profession and be prejudicial to its standard of service generally. The Commissioners have a great deal of information indicating that the original agreement has been greatly misunderstood.

111. National Health Insurance offers to the medical profession a very large aggregate income, part of which will indeed be merely the same income now received but supplied through another channel. Part of it will be new income received for work now done and for which no adequate recompense is received, and a third part will be in respect of payments for entirely new work. When National Insurance is in full operation all well-qualified practitioners are likely to be as fully occupied as they choose to be. The income of the profession from the insurance service is not likely to be the chief source of professional income, but it will place practitioners on a better economic basis than is available in other professions. Upon this foundation it may be expected that many of the younger members of the profession, and new entrants in course of time, will establish their careers.

112. It will probably be unusual for medical practitioners to rely chiefly on insurance practice for the greater part of their practice income, and the proposed limits to the number of insurance patients that they may accept on their lists is not intended to indicate the number of persons for whom an insurance practitioner is expected to take responsibility. The proportion of persons treated of the total persons on a practitioner's list will vary greatly between practitioners, and at different times and places, and the limitation referred to has little relevance to the prospective incomes of practitioners from all sources.

113. While the Commissioners are anxious to proceed with preparations for the establishment of the insurance medical service and regret some of the circumstances which led to the establishment of the Royal Commission, I desire to say that I welcome the inquiry that is now being conducted. The results of that inquiry will assist the Commissioners in a task which is sufficiently arduous, even if it is to be associated with the greatest degree of goodwill among the members of the medical profession.

#### ANNEXURE TO STATEMENT PREPARED FOR THE ROYAL COMMISSION ON THE REMUNERATION OF INSURANCE MEDICAL PRACTITIONERS.

#### STATEMENT OF PROPER AND NECESSARY MEDICAL SERVICES TO BE RENDERED BY INSURANCE MEDICAL PRACTITIONERS UNDER SECTION 47 OF THE NATIONAL HEALTH AND PENSIONS INSURANCE ACT 1938.

A general medical practitioner service including treatment of fractures and dislocations, and the performance of minor operations not involving a general anaesthetic, but excluding—

- (i) Confinements, that is to say, attendance in labour resulting in the issue of a living child, or attendance in labour after 28 weeks of pregnancy resulting in the issue of a child whether alive or dead, or attendance within ten days after labour in respect of any condition resulting therefrom.
- (ii) Cases falling within the provisions of the Commonwealth Seamen's Compensation Act, and any Act of a State under which compensation is payable in respect of injuries received or diseases

suffered, the Workers' Compensation Acts of the several States, and other insured risks such as motor accident cases in which the cost of treatment is covered by third party motor insurance.

- (iii) Venereal diseases—other than advice as to necessity for treatment and the infectivity of the condition.
- (iv) Anaesthetics necessitating the presence of a second practitioner.
- (v) X-ray investigation and treatment and radium treatment.
- (vi) Pathological investigation, massage, electrical diagnosis and treatment.
- (vii) Consultations, after full clinical investigation and adequate preliminary treatment.
- (viii) Amputations.
- (ix) Complicated fractures (such as fractured rib penetrating lung; fractured pelvis penetrating bladder; fractures causing lesions of nerves and large blood vessels), together with compound fractures of the larger bones (excluding phalanges) and fractures usually necessitating skilled attention of an orthopaedic surgeon (such as fractures of the femur); fractures needing open operation (including ununited fractures).
- (x) Fracture dislocations of the larger joints (excluding phalangeal joints); dislocation of the spine or hip, or any dislocation usually necessitating the skilled attention of an orthopaedic surgeon.
- (xi) Major operations; by this is meant operations—
  - (1) involving the opening of a closed body cavity, such as the meninges, pleura, peritoneum or joint cavities.
  - (2) involving operations upon organs not included above, such as the uterus, kidneys, ureters, bladder, urethra, eyes, thyroid.
  - (3) usually requiring the attention of a specialist (including, for example, mastoid operation, dissection of tonsils, nasal septum and sinus operations, operations for the treatment of malignant diseases.)
- (xii) Treatment usually requiring the attention of a specialist, for example, ophthalmological treatment not ordinarily performed by a general practitioner, treatment of special skin complaints requiring the attention of a skin specialist. Specialized treatment of the more serious bone and joint diseases, e.g., surgical tuberculosis, osteomyelitis and suppurative arthritis; and specialist treatment necessitating the services of a neurologist or psychiatrist.

Signed by the National Insurance Commission at Canberra this third day of August, 1938.

J. B. BRIDGEN, Chairman.  
D. McVEY, Commissioner.  
H. C. GREEN, Commissioner.

DISCUSSIONS OF PROPOSED NATIONAL INSURANCE MEDICAL SERVICE BETWEEN REPRESENTATIVES OF THE COMMONWEALTH GOVERNMENT AND THE EXECUTIVE COMMITTEE OF THE FEDERAL COUNCIL OF THE BRITISH MEDICAL ASSOCIATION IN AUSTRALIA.

Melbourne, 10th and 11th March, and Sydney, 28th and 29th March, 1938.

At Melbourne the representatives were—

#### Official:

Sir Walter Kinnear.  
Mr. J. B. Bridgen.  
Mr. T. Lindsay.  
Mr. H. C. Green.

#### Federal Council:

Sir Henry Newland.  
Dr. Newman Morris.  
Dr. G. Bell.  
Dr. F. Davies.  
Dr. T. Price.  
Dr. J. G. Hunter (Secretary).



As a basis for discussion the official representatives produced a document showing and comparing the chief features of the insurance medical service in England and Friendly Society contract practice in Australia, together with a short summary of the working of the English service, with special reference to the administrative principles of the scheme, the basis of remunerating insurance doctors and the extent to which representatives of insurance doctors themselves took part in the administration of that scheme.

A copy of the document circulated is scheduled to this Annexure.

Certain minor points arose from the consideration of the comparison of the two schemes.

The official representatives explained that the proposed criterion for the insurability under the proposed Insurance Act in Australia of persons not employed in manual labour was not an income of £365 a year, but a rate of remuneration of £365, that the insurability of an employment would not be affected by the fact that the employed person received income from some other source, and that manual labour was excepted from the remuneration limit on the ground that it was more liable to be intermittent, so that the discrepancy between rate of remuneration and income would normally be greater. On the other hand, consideration of income from all sources, in the groups that would be covered by the proposed scheme, from estimates made from census returns and later information, showed that, for 80 per cent. of the total, the income would be under £208 per annum, for 10 per cent. between £208 and £260, and for the remaining 10 per cent., £260 or over.

On the question of payment by the patient, under the Friendly Society contract service, for services outside the scope of the contract, the representatives of the Federal Council said that the assistance of Friendly Societies in the collection of such extras was mainly theoretical and they agreed that the fees for night service, for example, were often unpaid and that the right to charge such fees was used mainly as a deterrent against unnecessary calls on the doctor. The official representatives pointed out that the English scheme gave the responsible authorities power to fine an insured person who called in a doctor unnecessarily.

It was agreed that treatment of Workmen's Compensation cases should be excluded from the insurance medical service, and the representatives of the Federal Council asked that this exclusion should be embodied in the Bill.

On consideration of the persons to be insured under the proposed Australian legislation, the representatives of the Federal Council expressed the view that if a man now a member of a Friendly Society became insured, he would cease altogether his contribution to the society (for which is provided treatment for his wife and family as well as for himself) leaving the family to get from hospitals what treatment they required. It was suggested that such action was particularly probable in Queensland, where regional clinics are provided.

The representatives of the Federal Council suggested also that the maximum number of insured persons that should be on the list of an insurance doctor should depend on a variety of circumstances, in particular on the quality of the service to be provided.

It was explained by the official representatives that it was proposed that sickness certificates should be provided weekly, instead of fortnightly as under the Friendly Societies contract, but that on the other hand no certificates would be required under the insurance service for illness of insufficient duration to cover the waiting period for sickness benefit. [Now four days.]

After these documents had been examined, the representatives of the Federal Council said that they would concur generally in a proposal to establish an insurance medical service on the main lines of the service in operation in England, but they reserved from their concurrence two points of importance—

- (a) The method of defining the scope of the medical service to be given;
- (b) The major question of remuneration.

On the first of these points the representatives of the Federal Council contended that general practitioners in Australia, as a class, possessed skill and experience of a kind above that of general practitioners in England, as a class. In country districts in particular the general practitioner was often compelled to undertake work, and was competent to undertake work, outside the scope of the general practitioner service provided by the British scheme. Though they agreed that it was undesirable that the Australian scheme should encourage insurance doctors to undertake specialist and other work that they were not competent to perform, they held that the adoption for Australia of the British definition would mean the requirement of a substantially wider service.

It was, on the other hand, agreed that it was desirable that the scope of the insurance medical service should be wider than that of the Friendly Societies' contract practice and that, if the money could be found, a complete general practitioner service should be provided.

It was decided to take the Friendly Society scope as the basis for consideration, and to endeavour to widen the scope as much as practicable, taking into consideration the limitations as to cost imposed under a contributory scheme of this nature. Normally the Friendly Society medical service could be said to consist of a general medical practitioner service, but excluding confinements, Workmen's Compensation cases, fractures and dislocations, most minor operations, venereal diseases, general anaesthetics, X-ray investigation and treatment, pathological investigation and treatment, and all major operations.

After discussion it was agreed to include the treatment of fractures and dislocations, other than those of a complicated nature requiring special skill. This service was within the competence of the general practitioner and should be included within the National Insurance Scheme.

The doctors were generally averse to the inclusion of major operations and it was decided to include only operations which could not be classified as "major". It was suggested that "minor" and "major" were ambiguous terms, and that a more precise definition was required.

There was a difference of opinion amongst the British Medical Association representatives as to the desirability of including general anaesthetics. Some considered that administrative problems might arise frequently if they were excluded, but others doubted the desirability of their inclusion. It was important to check any excessive use of anaesthetics. One man should not administer a general anaesthetic and also operate. It was eventually decided to exclude general anaesthetics. On the other hand, much treatment necessitated the use of a local anaesthetic which should be included in the service. The insured persons would have to make private arrangements, as at present, for general anaesthetics, but efforts would be made to arrange a flat rate fee of £1 1s. for the service, and also to provide for disciplinary powers similar to those under the English Act to be given to the Medical Committees to supervise claims upon insured persons for this service.

[A more precise definition of the services not to be included in the scope of the insurance medical service has since been prepared and is before the Royal Commission.]

From this point the discussion proceeded to the question of the proper capitation fee for the proposed insurance medical service. It was agreed that it would be neither practicable nor desirable to pay different capitation fees in the different States. The official representatives pointed out that averaging the different rates paid by adult married males under Friendly Society contract practice in Australia (weighting the average according to the employed population of the area covered) produced a figure of 27s. per annum, for which treatment was provided not only for the contributor but for his wife and family. The average number of persons covered by each male member's capitation payment was agreed to be 3.2. The average capitation fee for each individual for whom treatment was provided under Friendly Society contract practice in Australia would then be about 8s. 5d.

It was agreed that, in the family group, the man himself required proportionately less treatment than his wife and family and the official representatives pointed out that the average age of the insured person would be substantially less than that of the average Friendly Society member. The fee arrived at on this basis should, however, be increased to take account of the services not covered by the Friendly Society contract, but which it was proposed to include in the insurance medical service. The representatives of the Federal Council claimed that the total sum received for extras was nearly as much again as the capitation fee, but admittedly that total included payments for confinements, for major operations and for Workmen's Compensation Act cases. There were, however, services such as the treatment of fractures and dislocations which should be included in the insurance medical service, which the general practitioner was competent to treat but for which he should receive payment additional to the equivalent of the Friendly Society capitation fee. Similarly, the provision of other than general anaesthetics should be included in the scheme. Additional charges suggested were 1s. for fractures and dislocations and 6d. for anaesthetics. (Adding these sums to 8s. 5d. gives approximately 10s.)

The official representatives suggested that another line of approach was by comparison with the British capitation fee of 9s., in force for about thirteen years and confirmed by a recent arbitration. The scope of the British scheme was slightly wider than that now suggested for Australia, but certain costs of living and of practice are higher in Australia. The cost of motoring was substantially higher, but certain items of domestic expenditure and practice expenditure combined did not appear to be more than 16 per cent. higher than in England. This line of approach appeared also to lead to a capitation fee of about 10s.

They referred also to some figures quoted in the *Medical Journal of Australia* for the 6th November, 1937, as to fees proposed for an insurance medical service in South Africa—a capitation fee of 9s. for persons with incomes up to £180 per annum and 13s. 6d. for those over that limit. If these rates were weighted by the estimated numbers of persons in somewhat corresponding income ranges in Australia, the average would again approximate to 10s.

Representatives of the Federal Council said that they had not contemplated a lower rate than 14s. and that if they were to return to their States and ask doctors to accept a fee so low as 10s. they would need to be fortified by strong arguments. The official representatives replied that if agreement could not be reached at a lower figure than 14s. it would be impracticable to provide medical benefit under the proposed Insurance Act.

The official representatives explained the proposals for the payment of mileage fees to country doctors. The proposed payment would be designed to cover both the cost of running the car and the time necessarily spent by the country doctor in travelling—in excess of the cost and time spent in travelling by the town doctor. Each of these two items was estimated at about 6d. per mile and the payment would therefore approximate to 1s. per mile each way for every mile travelled outside the limit covered by the ordinary capitation fee which, it was suggested, should be three miles from the nearest insurance doctor. The payment of mileage would not require records of the actual journeys undertaken to attend insured persons, but would be based on a modified capitation rate, weighted according to the distance of the patient. The payments required for mileage must at present be largely speculative, the distribution in distance of the patients, the number concerned and the average number of visits paid in a year to each insured person, were all unknown. Returns obtained in England for 1936 showed that on the average about 0.75 visits were paid annually (at the patient's house) for every insured person, well or ill, on doctors' lists. It seemed therefore a generous assumption that one visit a year would be paid in Australia for each insured person outside the limit of three miles.

The representatives of the Federal Council asked by whom the insurance medical service would be administered, and were informed that it would be administered by a

new authority, the Insurance Commission to be set up under the proposed Act.

It was agreed to be necessary that the Chief Medical Officer of the Commission should have the confidence of the medical profession and should know their difficulties from practical experience of general practice in Australia.

It was agreed also that the details of the Medical Benefit Regulations would be worked out in consultation with representatives of insurance doctors, with advice from the Medical Benefit Council.

Summing up the discussion the representatives of the Federal Council said that, on the general principles, they were satisfied on everything except the question of remuneration. They were satisfied that a figure of 20s. was too high and that the proper amount lay somewhere between 10s. 6d. and 15s.

On this point, the official representatives replied, the evidence available seemed, on more than one line, to lead to a capitation fee of 10s. There might be grounds for going beyond this figure, but sufficient evidence had not yet been produced to warrant such action.

On resumption of the discussion on the 11th March, which was attended by the Honorable R. G. Casey, Commonwealth Treasurer, the representatives of the Federal Council stated that they would have to consult the Branch Councils on the question of remuneration before they could come to any conclusions.

It was agreed that they should do this and that they should have assistance in the preparation of a statement that would make clear to Branch Councils the arguments that had been put forward. They were pressed to arrange for a resumption of the discussion as early as practicable, and it was agreed to resume in Sydney on the 28th March.

Sydney, 28th and 29th March, 1938.

At Sydney the representatives were:—

*Official:*

Sir Walter Kinnear.  
Mr. J. B. Bridgen.  
Mr. T. Lindsay.  
Mr. H. C. Green.  
Mr. D. McVey.

*Federal Council:*

Sir Henry Newland.  
Dr. Newman Morris.  
Dr. G. Bell.  
Dr. T. Price.  
Dr. J. G. Hunter  
(Secretary).  
Mr. E. H. Ward  
(Accountant).

The representatives of the Federal Council said that the statement prepared at the close of the meeting in Melbourne had been considered by the State Branch Councils and that, except on the question of remuneration, it had been considered generally satisfactory. They could not, however, accept as an estimate of the capitation fee payable for Friendly Society contract practice a figure that took account of the present rates in Victoria. These had been accepted by the profession under duress, had always been considered very inadequate and notice had been given to the societies a year ago that an increase would be asked for. The official representatives said that it was difficult to disregard a rate that had been judicially fixed at a time when the cost of living was substantially higher than at present and had remained in force for fifteen years. In any event they could not agree to a basis arrived at by excluding the lowest capitation rate and averaging the remainder. If the New South Wales rates were applied to the Victorian membership the figure of about 8s. 5d. mentioned in Melbourne would be increased to approximately 9s. (The Council did not explicitly accept this figure of 9s., but raised no serious objection.)

The second stage of the Council's argument dealt with the value to be placed on the services additional to that given under the Friendly Society contract that would be required under the insurance medical service. These were under three main heads: operations, fractures and dislocations, and anaesthetics. To evaluate the charge to be made for these services, the Council had sent a questionnaire, and had received 206 replies from doctors in lodge practice in New South Wales, whose lists represented about 55,000 members.



The fees actually received for the extra services in this section of lodge practice were reported to have been on the average—

	Per person.
	s. d.
For operations . . . . .	1 0
For fractures and dislocations . . . . .	1 0
For anaesthetics . . . . .	0 9

The official representatives asked whether the questionnaire had been accompanied by clear instructions that services arising from injuries for which Workmen's Compensation was payable, and suggested that major operations should be excluded from the return. These instructions had been issued, but not with the form of questionnaire, and it was admitted that some amounts might be included under these heads; some forms had been returned before the instructions had been issued. The amounts received varied over a very wide range in the sample of forms produced for inspection.

The Council also asked that some allowance, estimated at 1s. on the fee, should be made for loss of private and existing lodge practice. They were troubled by the prospect that men who are now on lodge lists will, if they become insured, discontinue their lodge subscriptions entirely and leave their dependants to be treated by hospitals—which give good service. The official representatives said that it did not seem reasonable that additions to the number of persons treated under contract practice should be made a ground for a claim to £100,000 per annum in perpetuity. The Council admitted that insurance doctors coming into the scheme after its inception would have no claim to compensation, and that it would be impracticable to give the compensation for a term of years and then discontinue it, but they asked that the point should be noted and considered.

Finally, the Council asked that a small allowance, put at 3d. a head, should be made for the additional clerical work that would be required. They did not seem to feel strongly that the amount of certification would be increased (in view of the absence of certificates for illnesses too short to give title to sickness benefit under the national scheme) but based their claim mainly on the requirement of clinical records. They said that no records were in practice kept under the Friendly Society system and alleged that the conditions of lodge practice left no time for such records; if records were wanted, the capitation fee should be such as would let a doctor get his remuneration from the smaller number of patients that would give him time to keep them.

Summarizing, the representatives of the Council said that they were prepared to give for 9s. a service of the same range as the present lodge practice—excluding fractures and dislocations, operations requiring an anaesthetic and the administration of anaesthetics. For a service including these items, they thought that there was a good case for asking 14s., but they would be prepared to accept 12s. They thought also that the limit of three miles for the payment of mileage was too great and should be reduced to two miles.

On mileage, they agreed that the rate of 6d. per mile was reasonable recompense for the cost of travelling and that the assumption of a gross annual income of £1,500 was not too low for assessing the value of time spent in travelling, but they thought that an average speed of 25 miles per hour was too high for country districts. They pointed out that the basis of 1s. per mile was the same as that used in England, though it was agreed that the rate in Australia should be higher. It was explained that the English rate was that used in assessing the total travelling expenses of rural doctors and was subject to a deduction representing the estimated travelling expenses of urban doctors. The proposal for Australia was to pay 1s. each way for each mile beyond three and the payment per "unit" in England was 1s. 2d. one way only. It was agreed that the effect of any offer for mileage must be largely conjectural until statistics had been accumulated, but that the total of £100,000 per annum should, so far as could be seen, provide generous additional payment

for the country doctor, amounting on the average to about £100 per country doctor per annum.

Both parties agreed that an inclusive service was greatly to be preferred if the necessary money could be found. The official representatives said that the difficulty was to justify an additional 3s. for the additional services discussed. The questionnaire on which the Council had evaluated the costs of those services was not very convincing and it did not seem probable that, if 3s. were the proper value of those services, which were included in the service given in England for 9s., the English insured person obtained the rest of the insurance medical services for 6s. (apart from the inclusion in that service of Workmen's Compensation treatment). The Council objected to any comparison based on conditions in England, South Africa or any other country, holding that the standards, both of practice and of remuneration, were higher in Australia.

(To be continued.)

## Post-Graduate Work.

### QUEENSLAND POST-GRADUATE COMMITTEE.

THE Queensland Post-Graduate Committee announces that two lectures will be delivered by Dr. W. B. Castle, of the Thorndyke Memorial Laboratories, the Boston City Hospital, Massachusetts, United States of America, on Tuesday, September 6, and Thursday, September 8, 1938, at 8.15 p.m., at the Physiology Theatre, University of Queensland, Brisbane.

The subjects will be: (i) "Diagnosis and Treatment of Anemias"; (ii) "Hemorrhagic Diseases".

Members desiring to attend are requested to make application for tickets to the British Medical Association Office, 225, Wickham Terrace, Brisbane, as soon as possible. The subscription will be one guinea.

## Correspondence.

### NATIONAL HEALTH INSURANCE.

SIR: We appear to be making a pathetic imitation of the writhings of our professional brethren in England in their health insurance net. Evidently our advisers are well instructed in the appropriate gestures for a body in this unpleasant situation. However, we are not yet completely in the trap.

To try to fight a government with statistics is like trying to fight the devil with fire, and the matter should be determined on principle. Is it in the best interests of the public or the profession to allow the intrusion of a third party? I say "no", and if the bulk of the profession is of the same opinion and will stay out of the scheme, it will fall to the ground.

Make no mistake, once we are in, whether it is for eleven shillings or twenty, our doom is sealed, for we can never come out again in a body, even if the capitation fee is drastically reduced as it was in England. Moreover, the Royal Commission is already about to discuss what we may or may not charge to dependants and others not in the scheme. A parallel has been drawn to friendly society service, but in all essentials they are as far apart as the poles.

I would urge the profession to accept no compromise and to refuse this scheme *in toto*. We are being presented with the thin end of the wedge, and once we put our heads in the trap, there will be no escape. Let us not be made the stalking horse of a national insurance and pensions scheme, under the guise of a health service. If

the Lyons Government is so impressed, as it must be, with the rising cost of pensions *et cetera*, let it come out naked and unashamed with a national contributory scheme to include everyone. I fear that the only time governments are naked and unashamed, is when making a salary grab at our expense.

Yours, etc.,

E. BRETTINGHAM MOORE.

Macquarie Street,  
Hobart,  
August 2, 1938.

DR. W. J. PENFOLD.

SIR: The opportune letters of Professor J. V. Duhig and Dr. T. a'B. Travers in recent issues of the journal have awakened in us a sense of responsibility for paying a tribute to the scientific worth of Dr. W. J. Penfold, especially in his capacity as first Director of the Baker Institute of Research.

It is our intention to record in some tangible form (for example, a portrait) our debt to his inspiration and devotion to scientific truth. We realize, however, that Penfold's influence has extended far beyond the confines of the Baker Institute and the Alfred Hospital, and that others might well wish to join us in this undertaking. If you will be good enough to open a subscription list for this purpose, Mr. Editor, so much the better; if not, any of the undermentioned signatories will be pleased to acknowledge subscriptions forthwith.<sup>1</sup>

Yours, etc.,

J. RINGLAND ANDERSON.  
LEONARD B. COX.  
EWEN DOWDIE.  
ROBERT FOWLER.  
ALFRED J. TRINCA.  
HUGH C. TRUMBULL.  
RUPERT A. WILLIS.

Alfred Hospital,  
Melbourne,  
August 10, 1938.

SIR: Amidst the welter of contradictory correspondence on national insurance, could you find a place for these few lines?

I have seen in your columns two letters in which is implied the retirement of Dr. W. J. Penfold, and containing tributes from Professor Duhig, of Brisbane, and Dr. Travers, of Melbourne. May I add mine as a quite unofficial representative of Sydney? I have known Penfold longer than most, for I first met him when he was a special researcher at the Lister Institute, London. He came from the north of England, and had given up his prospects in the practice of medicine because of the insatiable curiosity of his inquiring mind. Over coffee and rolls, our staple diet in those days, he delighted to pick holes in the sensitive fabric of medicine, embarrassed us with unanswerable questions, and was an epitome of the clean-up-the-world young people met with in research institutes at all epochs. Yet he did important fundamental work, and I imagine that better men than I agreed that he would go far. And far he did go; for he came to Australia to build up and be the first director of the Commonwealth Serum Laboratories, and those who have, if only periodically, seen that institution grow up know that Penfold did a good job for his adopted country. Though an outsider, I feel sure too that the Baker Institute owed much to his initiative and research spirit.

A controversialist to his finger-tips, and usually with the gloves off. Yet I always had the greatest respect for Penfold's ability, his hardy Norseman's uncompromising

attitude to life and men. If administration had not taken toll of his time and energy, his unquestioned flair for research would have taken him further than many of his contemporaries in two continents. I am sure that many others in Sydney would join with me in expressing appreciation of his services, and sincere regrets on his retirement. Well done, Penfold, a Listerian!

Yours, etc.,

A. H. TEBBUTT.

143, Macquarie Street,  
Sydney,  
August 10, 1938.

#### THE TREATMENT OF CANCER OF THE CERVIX UTERI.

SIR: Dr. Harold J. Ham, in a masterly critique (THE MEDICAL JOURNAL OF AUSTRALIA, August 6) of the results obtained in the series of cases reported by Dr. Schlink and Dr. Chapman (THE MEDICAL JOURNAL OF AUSTRALIA, July 16) asks if the authors can state the dosage received by the glands reported as showing no effect from radiotherapy.

From the data given in the paper it can be approximately calculated that the dosage received by cancer cells outside the uterus and situated more than about four or five centimetres (and possibly much less than this) from the vaginal cervix would receive less than the 5,000 units believed lethal to squamous-celled carcinoma over a time of about a week. Such cancer cells would on this view be insufficiently radiated.

Eighteen years ago, as a resident in the X ray department at the Royal Prince Alfred Hospital, I remember treatments of cancer of the uterine cervix by radium in which the dosage in parts of a small tumour must have been of the order of 150 r and possibly at low as 50 r at the pelvic wall. Yet at that time cervical cancer was being successfully treated at Stockholm and Paris by radium, and in the same year Seitz and Wintz reported successful treatment by "deep" X rays. Much more recently and with improved technique Coutard has given it as his opinion that patients less than eleven stone in weight can be so treated.

Dr. Ham makes an important point when he asks for better cooperation between the surgeon and the radiotherapist. Such cooperation has as one most important effect the shortening of the time lag in the adoption of improved methods of radiation.

Ten years ago, at the Stockholm International Congress of Radiology, in an invited paper on radiological teaching, I advocated the more general establishment of radiotherapy beds, and later such were established in my department at Cairo University. In *The British Medical Journal* of June 18, 1938, the opening of the new Institute of Radiotherapy at the Middlesex Hospital, London, is described, and there radiotherapy beds have been established.

The chief value in the provision of such beds is precisely that they ensure that cooperation between surgeon and radiotherapist which Dr. Ham advocates.

I understand that the provision of such beds has been advocated by the radiological staff of the Royal Prince Alfred Hospital, and it remains for the Board, under its chairman, Dr. Schlink, to give favourable consideration to such recommendation. The idea is not new or untried; indeed I understand such beds were established in Stockholm before the War.

Much money has been spent in Sydney on cancer work, and it is most desirable that the cure rate for cancer treated by radiotherapy alone in Sydney's largest teaching hospital should improve until it approaches that obtained elsewhere by this method or indeed the highly successful figure obtained by Dr. Schlink and Dr. Chapman by what is primarily an operative method.

Yours, etc.,

R. A. GARDNER.

235, Macquarie Street,  
Sydney,  
August 11, 1938.

<sup>1</sup> The Editor will be pleased to receive any contributions and will forward them to the proper quarter.



### THE NATIONAL HEALTH INSURANCE EMERGENCY FUND.

SIR: In reply to the letter of Dr. Edye and Dr. Traill, I should like to point out that when business of importance and complexity has to be transacted a small committee can always deal with it more efficiently and more expeditiously than a large one. However that may be, everyone must admit that at the rate of £500 each meetings of the Federal executive are far too costly. I cannot agree, for reasons mentioned in my original letter, that it is impossible to collect too large a sum. Is it not possible to make available the residue from the model lodge agreement fund for use in this, an almost parallel case, even if it means an Act of Parliament?

I feel that members should be asked to subscribe according to their means, with a suggestion that in no case need the amount exceed £5 5s., a course which, I am sure, will provide a larger total sum than the original demand.

I think that the balance sheet of receipts and expenditure connected with this fund should be published at regular intervals in the pages of this journal rather than only when the matter is concluded. This will inspire confidence on the part of the contributors.

Yours, etc.,

E. H. MOLESWORTH.

235, Macquarie Street,  
Sydney,  
August 19, 1938.

### ANÆSTHESIA IN PULMONARY TUBERCULOSIS.

SIR: In his criticism of Dr. Gilbert Brown's conclusions regarding the use of ether for producing anæsthesia in cases of pulmonary tuberculosis, Dr. M. P. Susman (THE MEDICAL JOURNAL OF AUSTRALIA, August 20, 1938) seems to have missed the essential point, namely, the high incidence (over 14%) of activation among those to whom ether had been administered. In fairness to Dr. Brown it should be restated that, of the 13,073 anæsthesia records he analysed, 208 related to patients suffering with pulmonary tuberculosis. Of these, 14 received ether, two of whom developed acute exacerbations of the disease within the next few days. The 194 non-ether cases exhibited no such complication. Considered in relation to its context, much force thus exists in Dr. Brown's implication that ether was the responsible factor and should therefore be avoided in such cases.

The fact that a surgeon has a bias in favour of ether does not necessarily mean that it is free from deleterious effects. Professor Churchill's good results possibly originate in a more careful selection of cases than, as Dr. Susman's second criticism suggests, is usual in this country. Here it is desirable to mention that Dr. Brown's observations regarding debility and pyrexia referred to "operations for treatment of pulmonary tuberculosis" and not thoracoplasty alone. However, the opinions emanating from Boston will require much support before they are entirely acceptable. A more searching analysis than that submitted is required, and it should be based on comparative statistics dealing with a wide range of anæsthetic agents. Meanwhile, the weight of evidence is opposed to the practice in vogue at the Massachusetts General Hospital.

Strong presumptive evidence is readily available, in any institution caring for tuberculous patients, of a relationship in certain cases between previous ether anæsthesia and the onset or exacerbation of symptoms. The association is too common to be fortuitous and, although absolute proof is difficult if not impossible to obtain, may not be ignored. The fact that a large proportion of tuberculous patients may be subjected to ether anæsthesia without apparent ill effect does not absolve us from responsibility in connexion with the remainder. Disastrous results too often follow ether anæsthesia in these cases, and it would be unreasonable not to admit that ether could be, and indeed was, the exciting factor.

The seriousness of the situation lies in the widespread ignorance or disregard of these facts, and the inculcation of beliefs calculated to enhance this complacency is to be deprecated. It is not too much to say that before ether is used on any patient, a family or personal history of tuberculosis should be excluded. Further, contacts, such as nurses and others in institutions caring for the tuberculous, should never be given ether if some alternative is available.

Yours, etc.,

S. V. MARSHALL.

135, Macquarie Street,  
Sydney,  
August 22, 1938.

## Proceedings of the Australian Medical Boards.

### SOUTH AUSTRALIA.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Practitioners Act* of 1919, of South Australia, as duly qualified medical practitioners:

O'Connor, Playford D'Arcy, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital, Adelaide.

Basedow, Karl Johannes, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital, Adelaide.

Goode, Henry Arthur, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital, Adelaide.

Norman, William Gowan, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital, Adelaide.

Fox, Una Alice Owen, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital, Adelaide.

Goldman, Maurice, M.B., B.S., 1938 (Univ. Sydney), Torrensville.

## Obituary.

### TOM FARRANRIDGE.

WE regret to announce the death of Dr. Tom Farranridge, which occurred on August 21, 1938, at Sydney, New South Wales.

### NOTICE.

WE have been asked by the chairman of the publicity committee of the Chemical Industries Exposition to publish the following notice.

The Australian Chemical Institute, with the support of the Chamber of Manufactures of New South Wales, the University of Sydney, and the Department of Education, is organizing a chemical industries exposition, to be held at the Sydney Town Hall from September 26 to September 30, 1938, inclusive, with the object of bringing before public notice the part played by chemistry and physics in industry and in everyday life.

The exposition, in addition to affording a liberal education in modern industrial technology and allied subjects, will be supplemented by a number of spectacular experiments and displays which will constitute novel forms of entertainment.

It is felt that the exposition will be of particular interest to many of your readers.

### Books Received.

- ANÆSTHESIA AND ANALGESIA FOR NURSES AND MID-WIVES**, by J. K. Watson, M.D.; 1938. Bristol: John Wright and Sons Limited; London: Simpkin Marshall Limited. Crown 8vo, pp. 135, with illustrations. Price: 3s. 6d. net.
- OPHTHALMIC NURSING**, by D. E. Grand, with a foreword by A. C. Hudson, M.D., M.A., M.B., Ch.B., F.R.C.S., L.R.C.P.; 1938. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 120, with illustrations. Price: 4s. net.
- CATECHISM SERIES: ANATOMY (OSTEOLOGY), PART IV**, by C. R. Whittaker, F.R.C.S.E., F.R.S.E.; Fifth Edition; 1938. Edinburgh: E. and S. Livingstone. Crown 8vo, pp. 76. Price: 1s. 6d. net.
- THE BIOLOGY OF ARTERIOSCLEROSIS**, by M. C. Winternitz, M.D., R. M. Thomas, M.D., and P. M. LeCompte, M.D.; 1938. Springfield: C. C. Thomas. Medium 8vo, pp. 142, with illustrations, of which many are in colour. Price: \$4.00 net.
- INJECTION TREATMENT OF VARICOSE VEINS AND HEMORRHOIDS**, by H. O. McPheeters, M.D., F.A.C.S., and J. K. Anderson, M.D., F.A.C.S.; 1938. Philadelphia: F. A. Davis Company. Medium 8vo, pp. 315, with 82 illustrations. Price: \$4.50 net.
- MATERIA MEDICA, DRUG ADMINISTRATION AND PRESCRIPTION WRITING**, by O. W. Bethea, M.D., Ph.G., Ph.M., F.C.S., F.A.C.P.; Fifth Edition, revised; 1938. Philadelphia: F. A. Davis Company. Medium 8vo, pp. 577. Price: \$5.00 net.
- SURGICAL NURSING AND AFTER TREATMENT: A HANDBOOK FOR NURSES AND OTHERS**, by H. C. Rutherford Darling, M.D., M.S., F.R.C.S., F.R.C.P.S.; Sixth Edition; 1938. London: J. and A. Churchill Limited. Crown 8vo, pp. 726, with illustrations. Price: 9s. net.
- A SYNOPSIS OF PHYSIOLOGY**, by A. R. Short, B.Sc., M.D., F.R.C.S., and C. L. G. Pratt, M.A., M.Sc., M.D.; Third Edition; 1938. Bristol: John Wright and Sons Limited; London: Simpkin Marshall Limited. Crown 8vo, pp. 325, with illustrations.

### Diary for the Month.

- SEPT. 1.—South Australian Branch, B.M.A.: Council.  
SEPT. 2.—Western Australian Branch, B.M.A.: Council.  
SEPT. 2.—Queensland Branch, B.M.A.: Branch.  
SEPT. 6.—New South Wales Branch, B.M.A.: Organization and Science Committee.  
SEPT. 7.—Victorian Branch, B.M.A.: Branch.  
SEPT. 9.—Queensland Branch, B.M.A.: Council.  
SEPT. 13.—New South Wales Branch, B.M.A.: Executive and Finance Committee.  
SEPT. 20.—New South Wales Branch, B.M.A.: Ethics Committee.  
SEPT. 21.—Western Australian Branch, B.M.A.: Branch.  
SEPT. 22.—New South Wales Branch, B.M.A.: Clinical Meeting.  
SEPT. 23.—Queensland Branch, B.M.A.: Council.  
SEPT. 27.—New South Wales Branch, B.M.A.: Medical Politics Committee.  
SEPT. 28.—Victorian Branch, B.M.A.: Council.  
SEPT. 29.—South Australian Branch, B.M.A.: Branch.  
SEPT. 29.—New South Wales Branch, B.M.A.: Branch.  
SEPT. 30.—New South Wales Branch, B.M.A.: Annual Meeting of Delegates.

### Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser", pages xviii to xxi.

- CAIRNS HOSPITALS BOARD, CAIRNS, QUEENSLAND: Assistant Medical Officer.  
CHILDREN'S HOSPITAL (INCORPORATED), PERTH, WESTERN AUSTRALIA: Junior Resident Medical Officers.  
COOK HOSPITALS BOARD, COOKTOWN, QUEENSLAND: Medical Officer.  
DEPARTMENT OF PUBLIC HEALTH, MELBOURNE, VICTORIA: Assistant Clinical Tuberculosis Officer.  
THE BROKEN HILL AND DISTRICT HOSPITAL, BROKEN HILL, NEW SOUTH WALES: Acting Assistant Surgeon Superintendent.  
THE HOSPITAL FOR SICK CHILDREN, LONDON, ENGLAND: Eunice Oakes Research Fellowship.  
THE QUEEN'S (MATERNITY) HOME INCORPORATED, ADELAIDE, SOUTH AUSTRALIA: Resident House Surgeon.  
VICTORIAN EYE AND EAR HOSPITAL, MELBOURNE, VICTORIA: Resident Surgeons.

### Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Prudential, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. House, 235, Wickham Terrace, Brisbane, B.17.	Brisbane Associate Friendly Societies' Medical Institute. Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
SOUTH AUSTRALIAN: Secretary, 178, North Terrace, Adelaide.	All Lodge appointments in South Australia. All contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 205, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.

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